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FUEL STORAGE AREA GROUNDWATER QUALITY STUDIES 1985 THUNDER BAY TGS EXTENSION

Report No 86-26-K

J. Complak
Chemist
Environmental and Inorganic
Research Section
Chemical Research Department

ABSTRACT

Data on the physical and chemical characteristics of groundwaters from the fuel storage areas at Thunder Bay TGS, for 1985, are discussed in this report. The data show groundwater quality to be similar to that of the previous years. Because pH, acidity and sulphate levels in waters on both sides of the drainage ditches are still inconsistent, no conclusion can be reached on the effect of the drainage ditches on groundwater quality.

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EXECUTIVE SUMMARY

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Data on the physical and chemical characteristics of groundwaters from the fuel storage area at Thunder Bay TGS, for 1985, are analyzed in this report. This survey is a continuation of surveys conducted by London Monenco Consultants and Ontario Hydro since 1979. The purpose of these surveys was to obtain baseline data on the hydrology and chemistry of the groundwater at the site. Data are required for design verification purposes and for evaluation of environmental impacts due to the placement of a lignite coal storage pile north of the plant and the construction of drainage ditches surrounding the lignite and bituminous coal piles.

Groundwater quality during 1985 is essentially similar to that of the past years. The pattern of low pH levels and high sulphate and iron concentrations around the bituminous coal pile observed in the past is also evident in the 1985 data.

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To Mr. D.K.A. Gillies
Manager
Environmental Protection
Central Thermal Services

FUEL STORAGE AREA GROUNDWATER QUALITY STUDIES
1985
THUNDER BAY TGS EXTENSION

INTRODUCTION

A survey of groundwater quality in the vicinities of the bituminous and the lignite coal piles at Thunder Bay TGS Extension (TBTGS), was conducted during 1985. This survey is a continuation of the 'preoperational' groundwater surveys conducted by London Monenco Consultants (LMC) during 1979/1/, and by Ontario Hydro during 1980-81/2,3/ and the 'postoperational' survey conducted by Ontario Hydro during 1982-83-84/4,5,8/. The data obtained during the 1985 survey are summarized and discussed in this report.

The purpose of these surveys was to obtain baseline data on the hydrology and chemistry of the groundwater at the site prior to 1982, considered to be the 'preoperational' period, and on the water quality during the subsequent years, considered to be the 'postoperational' period. These data are required for design verification purposes and for evaluation of environmental impacts due to:

(i) the placement of a lignite coal storage pile and coal transfer activities north of the plant, and

(ii) the construction of drainage ditches, along the north and east sides of the lignite coal storage area and along the south and east sides of the bituminous coal pile (see Figure 1), to collect and hold surface run-off to minimize infiltration of coal leachate to the ground water.

The accumulated data will also serve to identify any future changes in groundwater quality and to indicate if and when any corrective action should be taken.

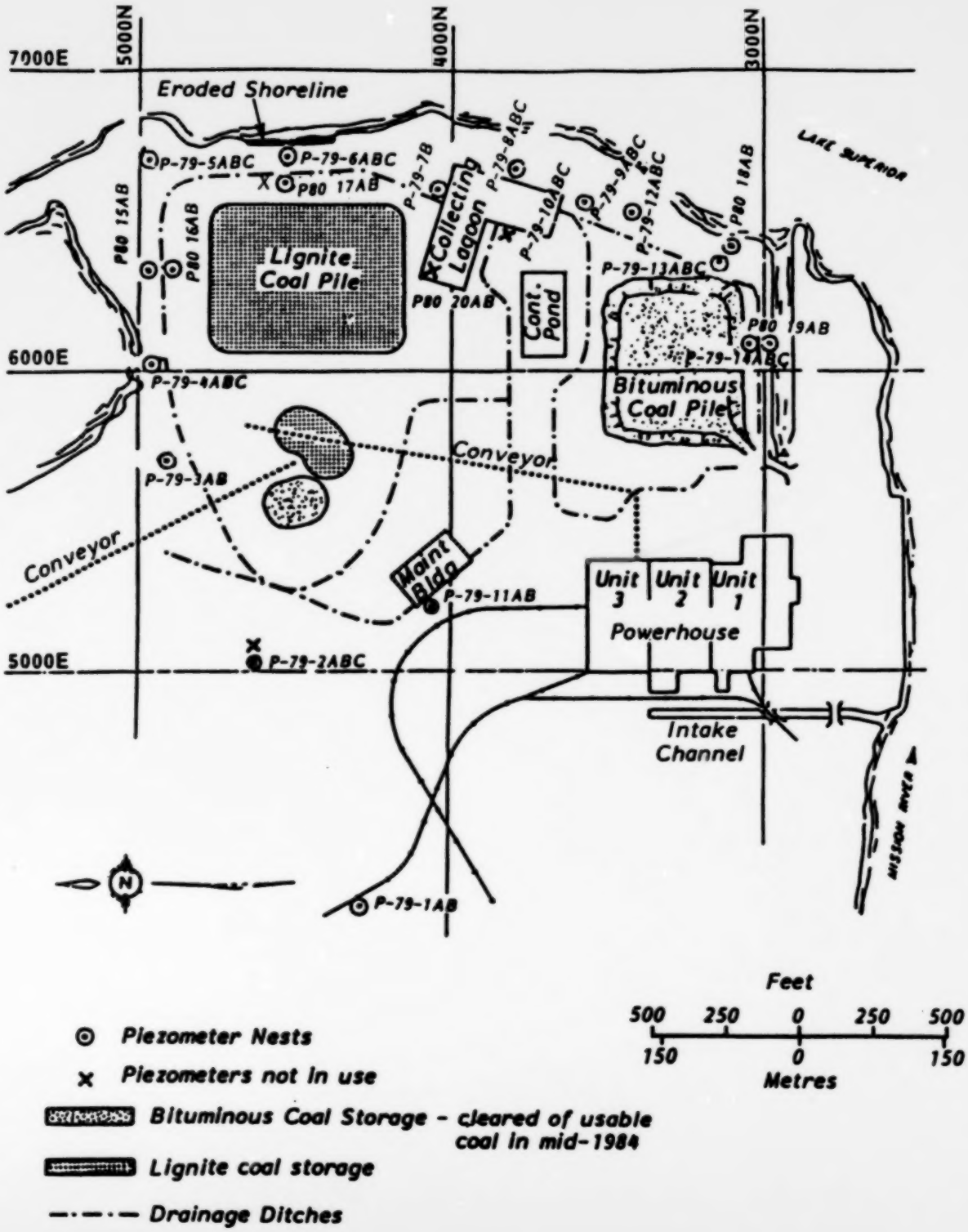

FIGURE 1

PIEZOMETER, PONDS, DITCHES, SHORE EROSION AREA AND FUEL STORAGE LOCATIONS THUNDER BAY TGS EXTENSION

1985

168014 RD

These surveys were conducted at the request of Ontario Hydro's Central Thermal Services - Environmental Protection Department on behalf of the Thunder Bay Project.

HISTORY OF THE FUEL STORAGE AREA - TO END OF 1985

The following is a brief outline of the main events in the history of the 'Fuel Storage Areas' shown in Figure 1.

(1) The coal pile for Unit #1 (sub-bituminous coal) has existed since the 1950's.

(2) Coal (lignite) for Units #2 and #3 has been stockpiled in the 'lignite storage area' since late 1980. New lignite was stockpiled beginning in early 1981.

(3) Ditches to intercept coal pile drainage (Figure 1) were completed in November 1981.

(4) Significant erosion of the shoreline in the vicinity of piezometer nest 6 occurred in 1983. Piezometer nest 6 is now only 1 m away from the shoreline. Piezometer nest 5 is also expected to be similarly affected.

(5) A 100 m section in the central part of the eroded shoreline was rehabilitated in October 1983, and the remaining 300 m section was rehabilitated in September 1984.

(6) The bituminous coal storage area was cleared of usable coal in mid-1984. Only about 1 200 Mg of bituminous coal remains east of the lignite pile.

METHODOLOGY

The following is an outline in the original preparatory field work carried out and the test methods used to obtain the raw data needed to characterize the hydrology and the quality of the run-off and the ground water in the coal storage areas.

1. Piezometer Installation

Initially a piezometer network, consisting of 39 piezometers at 14 sites, was installed in 1979 by London Monenco Consultants Ltd/1/. Additional 12 piezometers were installed at six sites in 1980 by Ontario Hydro. The piezometers are, for the most part, in silty sand ground layer and were installed to monitor lower, middle and upper sections of this deposit. Further installation details are given in Ontario Hydro Research Report No 85-179.

2. Piezometer and Groundwater Level Surveys

Measurements of the piezometer reference elevations and of groundwater levels in piezometers were conducted by personnel from the Civil Research Department and TBTGS. The levels are reported as elevations relative to the average lake shoreline level of 182.88 m (600 ft) for the Thunder Bay area.

3. Groundwater Sampling

In general, the following water level measurement and sampling procedures were used by station personnel.

(a) Bailing

- Groundwater levels in each piezometer were measured and recorded. The water from each piezometer was bailed out with a hand-operated pump or a vacuum pump.
- Four days later the water from each piezometer was bailed out again.

(b) Sampling

- One day after the second bailing about 1 L of groundwater from each piezometer was collected into an acid cleaned LPE bottle.
- The water's pH and conductivity were measured immediately with portable pH and conductivity meters.

(c) Preparation

- All samples collected were stored in a refrigerator at about 4°C.
- All samples were filtered as soon as possible using 0.45 µm prewashed Millipore filters.
- A pretreated 500 mL LPE bottle was filled with the filtrate to which were added 2.5 mL of "ULTREX" HNO_3.
- A portion of the remaining filtrate was used for selected field tests.

(d) Shipping

- The remaining filtrate (from c) was kept at about 4°C in a cooler with ice packs, and shipped (by air) with the acidified samples to Research Division for analysis.

4. Groundwater Tests and Analysis

(a) Partial Analysis at TBTGS

The parameters determined in 1985, by TBTGS personnel, were pH, conductivity, and alkalinity.

(b) Comprehensive Analysis - Research Division

Comprehensive chemical analyses of the groundwater samples were carried out by the Analytic Services Section of the Chemical Research Department. The characteristics determined in 1985 are shown below:

pH		Calcium	Ca
Conductivity, mS/m		Magnesium	Ma
Alkalinity as $CaCO_3$		Sodium	Na
Acidity as $CaCO_3$		Potassium	K
Sulphate SO_4		Iron	Fe
Chloride Cl		Manganese	Mn
Boron B			

(c) Analytical Methods

The analytical methods used were mainly those outlined in the Standard Methods for the Examination of Water and Wastewater, published by the American Public Health Association (14th Edition)/6/. Ion chromatography, neutron activation and other instrumental techniques, currently in general use by the Analytic Services Section, were also used for some determinations.

5. Rationale

(a) Field Tests

Because some characteristics of natural waters change rapidly after sampling, pH and conductivity were measured in the field and alkalinity was determined in the station's laboratory on stored samples.

(b) Comprehensive and Partial Analysis

Because of their complexity and time required, comprehensive analyses were carried out by the Analytic Section of the Chemical Research Department, Research Division.

(c) Parameter Significance

Of the parameters determined, pH, conductivity, acidity, alkalinity and concentrations of SO_4 and Fe are considered as

the main indicators of coal leachates. These parameters were used to distinguish between contaminated groundwaters and local surface waters.

The above indicators of coal leachates are common to both the bituminous and the lignite coals. However, the two types of leachates differ in their acidity and alkalinity levels. Leachates from bituminous coal are usually very acidic (low pH and low alkalinities). Leachates from freshly stockpiled lignite coal are usually alkaline (pH > 7 and low acidity)/7/.

Sulphate is regarded to be the most reliable indicator of the presence of bituminous coal leachates. High iron concentrations and low pH levels (high acidity and low alkalinity) are also indicative but they are more prone to modification on passage through the soil. The remaining parameters are less reliable contaminant indicators but do help in general characterization of water quality.

RESULTS OF FIELD AND LABORATORY WORK CONDUCTED IN 1985

1. Piezometer Network Level Surveys

The 1985 piezometer elevation surveys were carried out by the Civil Research Department on June 13. The 1985 results, together with those obtained from 1979 through 1984 are summarized in Table I. Locations of the piezometers are shown in Figure 1.

2. Groundwater Level Surveys

Measurements of groundwater levels in piezometers on the perimeters of the fuel piles were carried out on three occasions during 1985. The results are shown in Table II. Included in the table are Lake Superior water levels (relative piezometer monthly means) obtained from Fisheries and Oceans, Services Branch, Ottawa.

3. Groundwater Characteristics

The detailed analytical results obtained at Thunder Bay TGS and at Research on groundwater samples taken on June 25 and Sept. 11 are shown in Appendix A. The limited results obtained at Thunder Bay TGS are also included in the summary. However, because they were obtained on the same samples that were submitted for the comprehensive analysis, the results are shown under a different date (one day after the actual sampling) to avoid computer problems in recalling the data in the future.

TABLE I

FUEL STORAGE AREA - GROUNDWATER QUALITY STUDIES - 1979-1985
THUNDER BAY TGS EXTENSION

PIEZOMETER REFERENCE LEVELS
(1979-1985)

Piezometer Identification	Piezometer Reference Levels, m (Relative to Average Shoreline Level of 182.88 m)										
	Date Surveyed										
	(1) 1979	(2) 1980	July 16/81	Nov 2/81	June 9/82	Nov 3/82	May 18/83	May 15/84	Jun 13/85	Δ	Δ'
P79 1A	2.76	-	-	-	-	-	-	-	-	-	-
1B	2.72	-	-	-	-	-	-	-	-	-	-
P79 2A	3.13	-	-	-	-	-	-	-	-	-	-
2B	3.14	-	-	-	-	-	3.14	-	-	-	-
2C	3.13	-	-	-	-	-	3.14	-	-	-	-
P79 3A	1.80	-	-	-	-	-	3.13	-	-	-	-
3B	1.87	-	-	-	-	-	2.06	2.09	-	-	-
P79 4A	3.00	-	-	-	-	-	2.07	2.10	-	-	-
4B	2.98	-	2.99	3.05	3.01	3.00	3.01	3.00	3.01	0.01	0.01
4C	3.02	-	2.94	3.01	2.97	2.95	2.96	2.96	2.96	0.00	-0.02
P79 5A	3.50	-	2.97	3.04	2.99	2.98	2.99	2.98	2.98	0.00	-0.04
5B	3.55	-	3.42	3.55	3.53	3.52	3.56	3.56	3.56	0.00	0.06
5C	3.61	-	3.48	3.61	3.59	3.58	3.62	3.63	3.65	0.02	0.10
P79 6A	3.18	-	3.52	3.65	3.62	3.46	3.64	3.66	3.67	0.01	0.06
6B	2.96	-	3.17	3.30	3.29	3.28	3.30	3.32	3.34	0.02	0.16
6C	2.75	-	3.00	3.14	3.15	3.14	3.21	3.26	3.31	0.05	0.35
P79 7A	2.39	-	2.73	2.87	2.87	2.86	2.90	2.95	3.03	0.08	0.28
7B	2.73	-	2.42	2.42	2.41	2.41	2.40	2.40	2.40	0.00	0.01
7C	2.89	-	2.72	2.74	2.72	2.71	2.71	2.71	2.71	0.00	-0.02
P79 8A	2.41	-	2.93	2.93	2.91	2.70	2.90	2.90	2.90	0.00	0.01
8B	2.63	-	2.42	2.46	2.45	2.44	2.44	2.44	2.46	0.02	0.05
8C	2.57	-	2.65	2.68	2.66	2.65	2.65	2.65	2.68	0.03	0.05
P79 9A	2.10	-	2.58	2.64	2.63	2.63	2.63	2.64	2.65	0.01	0.08
9B	2.09	-	2.38	2.37	2.46	2.45	2.50	2.54	2.59	0.05	0.49
9C	2.11	-	2.43	2.43	2.53	2.44	2.53	2.58	2.66	0.08	0.57
P79 10A	2.65	-	2.70	2.39	2.49	2.48	2.58	2.62	2.69	0.07	0.58
10B	2.64	-	-	-	-	-	-	-	-	-	-
10C	2.66	-	-	-	-	-	-	-	-	-	-
P79 11A	2.90	-	-	-	-	-	-	-	-	-	-
11B	2.90	-	-	-	-	-	2.91	-	-	-	-
P79 12A	1.78	-	-	-	-	-	2.91	-	-	-	-
12B	1.83	-	2.19	2.05	2.08	2.07	2.11	2.14	2.19	0.05	0.41
12C	1.88	-	2.18	2.15	2.19	2.19	2.30	2.33	2.38	0.05	0.55
P79 13A	2.06	-	2.08	2.17	2.18	2.17	2.24	2.26	2.29	0.03	0.41
13B	2.03	-	2.16	2.13	2.17	2.16	2.18	2.18	2.18	0.00	0.12
13C	2.03	-	2.17	2.14	2.15	1.94	2.16	2.19	2.19	0.00	0.16
P79 14A	2.25	-	2.22	2.19	2.19	2.19	2.22	2.23	2.26	0.03	0.23
14B	2.20	-	2.33	2.33	2.35	2.33	2.33	2.37	2.39	0.02	0.14
14C	2.25	-	2.34	2.30	2.35	2.34	2.35	2.39	2.43	0.04	0.23
P80 15A	-	3.60	2.37	2.29	2.29	2.28	2.27	2.28	2.29	0.01	0.04
15B	-	3.56	3.47	3.58	3.54	3.53	3.57	3.58	3.60	0.02	0.00
P80 16A	-	3.38	3.51	3.61	3.58	3.57	3.61	3.63	3.66	0.03	0.10
16B	-	3.31	3.26	3.36	3.37	3.36	3.41	3.17(3)	Destroyed	-	-
P80 17A	-	3.35	3.34	3.43	3.45	3.44	3.51	3.42	Destroyed	-	-
17B	-	2.95	2.87	3.01	3.02	3.01	3.08	3.14	Destroyed	-	-
P80 18A	-	2.17	3.28	3.41	3.42	3.42	3.48	3.55	Destroyed	-	-
18B	-	2.17	2.25	2.21	2.21	2.21	2.22	2.25	2.30	0.05	0.13
P80 19A	-	2.27	2.24	2.20	2.19	2.18	2.21	2.24	2.28	0.04	0.11
19B	-	2.66	2.31	2.27	2.24	2.22	2.21	2.21	2.22	0.00	-0.05
P80 20A	-	2.92	2.70	2.66	2.62	2.61	2.59	2.60	2.61	0.01	-0.05
20B	-	2.54	2.94	2.87	-	-	-	-	Destroyed	-	-
			2.55	3.14	-	-	-	-	Destroyed	-	-

(1) London Monenco Consultants Ltd., Baseline Report for Ontario Hydro Thunder Bay TGS Extension - Groundwater Monitoring Study - Coal Storage Area (B-2) Feb. 1980.

(2) Ontario Hydro data.

(3) Top of piezometer broken off.

Δ Change from previous levels (m).

Δ' Change from the original (1979 or 1980) levels, m

TABLE II

FUEL STORAGE AREA - GROUNDWATER QUALITY - 1985
THUNDER BAY TGS EXTENSION

RELATIVE PIEZOMETER AND LAKE WATER LEVELS - 1985
(Relative to Average Shoreline Level of 182.88 m)

Piezometer Identification	Relative Water Levels in Piezometers (m)		
	Dates Measurements Taken		
	June 25, 1985	Aug. 20, 1985	Sept. 10, 1985
P79 1A	1.07	1.03	0.94
P79 1B	1.07	1.03	0.93
P79 2A	-	-	-
P79 2B	-	-	-
P79 2C	-	-	-
P79 3A	0.45	0.47	0.57
P79 3B	0.50	0.49	0.22
P79 4A	0.38	0.44	0.44
P79 4B	0.38	0.44	0.50
P79 4C	0.36	0.44	0.47
P79 5A	0.32	0.34	0.38
P79 5B	0.34	0.39	0.43
P79 5C	0.32	0.41	0.43
P79 6A	0.22	0.31	0.36
P79 6B	0.26	0.35	0.49
P79 6C	0.23	0.34	0.39
P79 7A	-0.10	-0.04	0.40
P79 7B	-0.09	-0.03	0.40
P79 7C	-0.04	0.01	0.39
P79 8A	-0.33	-0.02	0.48
P79 8B	-0.14	-0.03	0.40
P79 8C	-0.04	0.04	0.42
P79 9A	0.24	0.31	0.43
P79 9B	0.24	0.32	0.45
P79 9C	0.25	0.33	0.41
P79 10A	-	-	-
P79 10B	-	-	-
P79 10C	-	-	-
P79 11A	0.99	0.99	0.96
P79 11B	0.99	0.99	0.91
P79 12A	0.29	0.35	0.42
P79 12B	0.29	0.35	0.41
P79 12C	0.29	0.33	0.17
P79 13A	0.40	0.45	0.52
P79 13B	0.37	0.42	0.42
P79 13C	0.32	0.38	0.41
P79 14A	0.30	0.32	0.39
P79 14B	0.31	0.36	0.40
P79 14C	0.29	0.38	0.40
P80 15A	0.55	0.65	0.60
P80 15B	1.21	1.24	1.01
P80 16A	-	-	-
P80 16B	-	-	-
P80 17A	-	-	-
P80 17B	-	-	-
P80 18A	0.30	0.38	0.74
P80 18B	0.29	0.36	0.41
P80 19A	0.26	0.33	0.38
P80 19B	0.28	0.37	0.39
P80 20A	-	-	-
P80 20B	-	-	-
Lake Level (1)	0.41	0.55	0.60

(1) Relative average monthly lake levels (relative to 182.88 m average lake level) for Station 10050, Thunder Bay Harbour. Data obtained from Marine Environmental Data, Services Branch, Fisheries and Oceans, Ottawa.

DISCUSSION OF FIELD AND LABORATORY WORK CONDUCTED IN 1985

1. Piezometer Reference Levels

The piezometer reference levels for 1985, given in Table I, show that from May 15, 1984 to June 13, 1985, the levels of 24 piezometers rose slightly (<0.08m), and nine remained the same. Level increases of 0.05 m or more occurred for piezometers 6B, 6C, 9A, 9B, 9C, 12A, 12B and 18A, all located on the east side of the lignite and bituminous coal piles. These piezometers also rose in 1984 and had the greatest increases since the start of monitoring in 1979. These slight increases could be the results of some physical peculiarities in the shoreline area. Piezometers 16A and 16B were damaged in 1985 so their levels are not available.

2. Groundwater Levels

The piezometer water level data acquired in 1985 (from June 25 to Sept 10) and presented in Table II, show that groundwater levels in the fuel storage areas varied from a low of -0.33 m below the average shoreline level of 182.88 m (the reference level used since 1980) in piezometer 8A on June 25 to a high of 1.24 m in piezometer 15B on August 20. Other low (negative) levels were present in piezometers 7A,7B,7C,8B and 8C. The high levels were in piezometers 1A,1B,11A, 11B and 15B. The pattern of low and high water levels observed during 1985 is essentially the same as in 1982-83 and 1984. The lowest groundwater levels exist in the area southeast of the lignite pile. High groundwater levels exist in the areas north and west of the lignite pile. This pattern of groundwater levels is similar to that observed in the previous years.

The relationships between the groundwater levels, as represented by the water levels of several selected piezometers, the lake water levels, and total precipitation*, illustrated in Figure 2 again show that the water levels covered a greater range (lows to highs) towards the end of spring than they did in the late summer. Although in general, there appears to be no correlation between groundwater levels and lake water levels groundwater

* Table III shows data on the Lake Superior water levels obtained from Fisheries and Oceans, Services Branch, Ottawa. Total precipitation data were obtained from Environment Canada, Atmospheric Environment Service, Canadian Climate Centre, Downsview, Ontario.

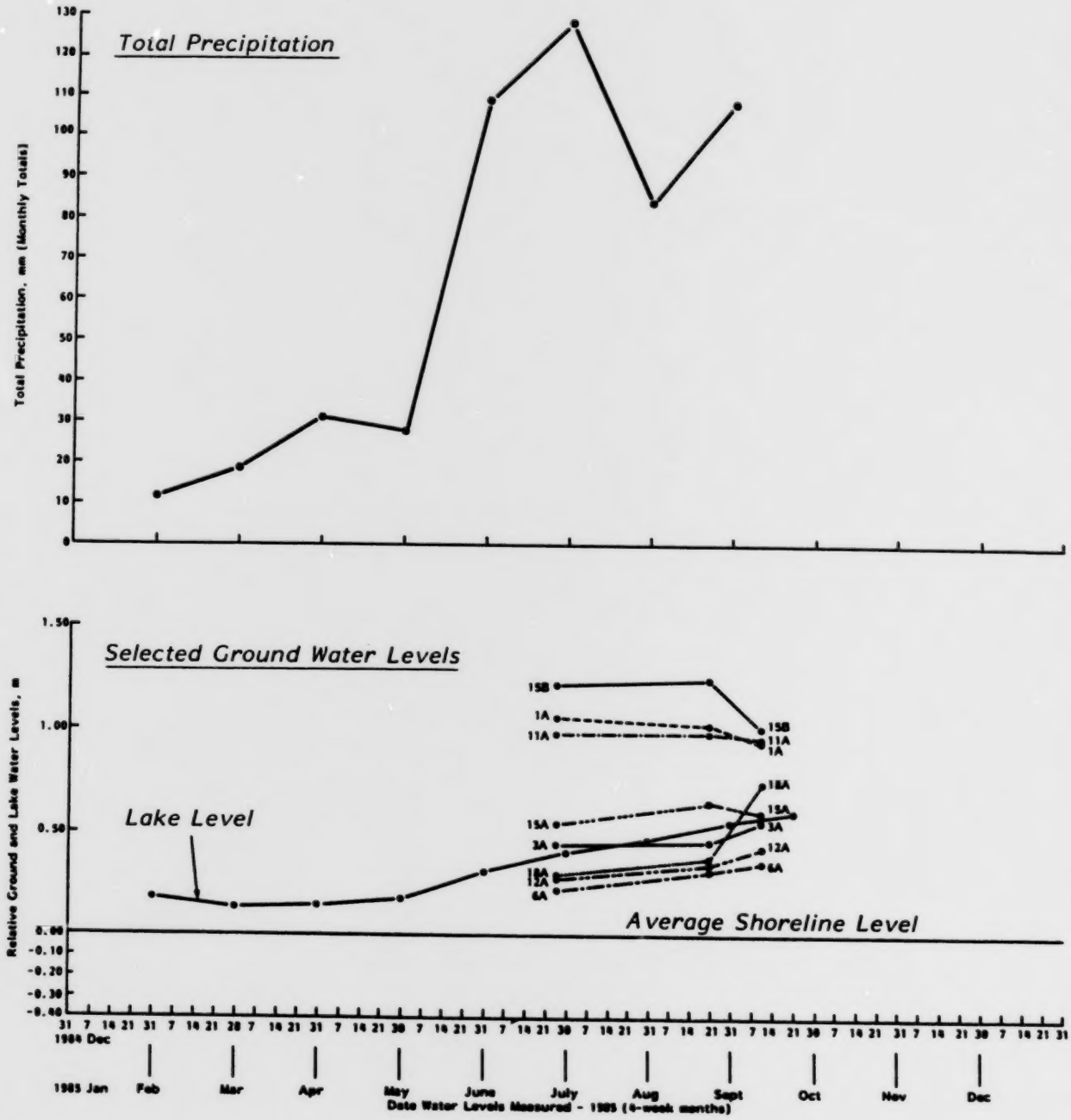

FIGURE 2

FUEL STORAGE AREA GROUND AND LAKE WATER LEVELS (m)* AND TOTAL PRECIPITATION (mm)

***(Relative to Average Lake Shoreline Level of 182.88 m)**

DAILY MEAN LEVELS — MOYENNES JOURNALIERES DE NIVEAU D'EAU

STATION 10050 THUNDER BAY ONT

LAT	MONTH	YEAR	MONTHLY MEANS	DAILY MEANS											HIGH INSTANTANEOUS			LOW INSTANTANEOUS		
															DAY	TIME	HT	DAY	TIME	HT
1	16	1	85		18311	18313	18313	18310	18312	18311	18310	18309	18310	18309						
1	20	1	85		18308	18309	18311	18303	18308	18310	18307	18305	18303	18303						
1	31	1	85	183072	18303	18304	18306	18306	18302	18307	18304	18306	18306	18305	18304	3	815	18321	14	430	18294
				(0.192)*																
1	10	2	85		18304	18304	18303	18303	18303	18302	18301	18300	18302	18303						
1	20	2	85		18300	18299	18298	18298	18302	18303	18302	18300	18302	18304						
1	28	2	85	183022	18304	18303	18302	18302	18306	18301	18304	18306				20	2030	18312	12	1900	18293
				(0.142)																
1	10	3	85		18302	18302	18302	18303	18301	18306	18306	18304	18305	18305						
1	20	3	85		18301	18302	18305	18301	18303	18302	18302	18305	18302	18301						
1	31	3	85	183026	18304	18302	18301	18300	18303	18303	18302	18300	18301	18302	18301	4	1700	18315	29	1315	18289
				(0.146)																
1	16	4	85		18301	18305	18304	18304	18302	18298	18302	18301	18305	18304						
1	20	4	85		18304	18302	18305	18307	18307	18303	18308	18305	18307	18308						
1	30	4	85	183067	18308	18310	18312	18312	18312	18311	18313	18314	18316	18312		19	430	18323	19	1700	18286
				(0.187)																
1	10	5	85		18313	18313	18313	18317	18315	18316	18316	18319	18318	18317						
1	20	5	85		18321	18321	18320	18319	18321	18319	18321	18323	18323	18322						
1	31	5	85	183143	18323	18326	18322	18322	18322	18322	18322	18323	18323	18323	18321	31	545	18334	5	1715	18305
				(0.313)																
1	10	6	85		18326	18326	18326	18327	18327	18328	18329	18328	18326	18327						
1	20	6	85		18326	18326	18327	18328	18327	18328	18330	18327	18328	18330						
1	30	6	85	183237	18331	18332	18329	18330	18330	18333	18333	18333	18331	18332		25	2330	18345	9	1730	18316
				(0.407)																
1	10	7	85		18333	18332	18333	18334	18332	18333	18334	18335	18333	18333						
1	20	7	85		18334	18335	18334	18334	18334	18334	18336	18337	18336	18338						
1	31	7	85	183357	18336	18337	18339	18340	18339	18339	18340	18339	18338	18339	18338	24	400	18346	4	1130	18324
				(0.477)																
1	10	8	85		18338	18340	18340	18340	18341	18341	18339	18340	18342	18340						
1	20	8	85		18341	18345	18346	18343	18342	18342	18346	18345	18342	18342						
1	31	8	85	183627	18343	18343	18345	18345	18344	18346	18345	18344	18344	18344	18346	31	1945	18357	10	1145	18330
				(0.547)																
1	10	9	85		18343	18346	18349	18349	18348	18351	18348	18348	18349	18348						
1	20	9	85		18348	18347	18348	18347	18348	18349	18350	18348	18350	18344						
1	30	9	85	183478	18346	18348	18349	18348	18348	18348	18349	18347	18346	18347		6	1500	18363	18	2315	18335
				(0.598)																
1	10	10	85																	

Table III

LAKE SUPERIOR WATER LEVELS - 1985

STATION 10050

THUNDER BAY

Obtained from Marine Environment Data, Services Branch, Fisheries and Oceans, Ottawa, Ontario, Canada

*( ) These values are the difference between the monthly means and the average shoreline level of 182.88 m)

levels appear to increase (relative to lake levels) after heavy precipitation. As in previous years, the changes in groundwater levels appear to be seasonal, and somewhat affected by significant precipitation, rather than being influenced by lakewater levels.

3. Groundwater Quality

The data on the chemical characteristics of the groundwaters sampled in 1985 are summarized in Appendix A. The main characteristics of the groundwaters from locations around the lignite and the bituminous coal piles are discussed below.

(a) pH

A summary of the 1985 pH levels of the groundwaters from the fuel storage areas is shown in Table IV. Figure 3 shows a plot of pH levels in waters from six selected piezometers from 1979 through 1985. Piezometer 17A was destroyed in 1985 so data for it is missing.

The 1985 pH levels of the groundwaters in the fuel storage areas are almost all in the range between 3.6 (13A) and 7.7 (05A and 08A). Again it is observed that after filtering and transporting to the Research laboratory, the pH levels of some samples dropped and rose in others. This has been the pattern since the start of these studies and is attributed to measurement differences caused by the presence of soil particles in the unfiltered samples and exposure of the samples to the atmosphere (oxygen) during filtration and storage.

As in the past waters of very low pH levels (5 or less) were present in piezometers 09B, 12B, 13A, 13B, 13C, 14A, 14B, 18B, 19A and 19B. All of these piezometers are located on the east and south sides of the bituminous coal pile. Waters of higher pH levels were present in the remaining piezometers, all located north and west of the two coal piles. This is consistent with pH levels obtained in the previous years.

Comparison of the 1985 groundwater pH levels with pH levels present during the period between 1979 and 1984 (Figure 3) shows essentially the same pattern, that is, low (acidic) pH levels in the waters around the bituminous coal pile and neutral or alkaline pH levels in waters away from and around the lignite pile. In general in 1985 the groundwaters around the bituminous coal pile were slightly less acidic than they were during the previous years, especially from piezometers 19A and 19B which had very low pH levels in 1982.

TABLE IV

FUEL STORAGE AREA GROUNDWATER QUALITY
TBTGS - 1985

TEST: pH

Location	Sampling Date 850625	850626*	850911	950912*
01A	7.2	6.6	7.4	6.7
01B	6.6	6.5	7.0	6.4
03A	6.7	6.5	6.9	6.4
03B	6.6	6.6	6.8	6.3
04A	6.7	6.4	7.0	6.4
04B	6.5	6.3	7.0	6.4
04C	6.6	6.5	7.2	6.7
05A	7.7	7.0	7.6	6.9
05B	7.0	6.7	7.6	6.6
05C	6.9	6.6	7.3	6.6
06A	7.7	6.9	7.5	6.9
06B	6.9	6.6	7.4	6.8
06C	6.7	6.4	7.0	6.4
07A	7.7	6.8	7.6	6.7
07B	7.2	6.8	7.4	6.8
07C	7.4	6.8	7.5	6.8
08A	7.5	7.0	7.7	7.0
08B	7.5	6.9	7.6	6.9
08C	7.0	6.6	7.5	6.7
09A	6.9	6.7	7.4	7.1
09B	5.6	6.1	4.8	6.1
09C	6.0	5.9	6.5	6.0
11A	6.8	6.7	7.0	6.5
11B	6.4	6.5	6.9	6.4
12A	6.0	6.5	5.5	6.3
12B	5.7	6.1	4.0	6.1
12C	5.8	5.3	5.7	--
13A	4.0	3.7	3.8	3.6
13B	5.0	5.7	4.5	6.7
13C	5.1	5.9	4.0	6.0
14A	4.8	6.0	4.9	5.6
14B	5.6	5.9	4.2	5.7
14C	6.2	6.0	5.3	6.0
15A	6.9	6.6	7.1	6.6
15B	7.1	6.4	7.3	6.6
16A	6.8	6.5	7.1	6.6
16B	6.8	6.5	7.1	6.9
18A	5.6	5.9	5.4	6.0
18B	5.8	5.9	4.8	6.0
19A	5.0	5.9	4.5	5.6
19B	5.5	5.3	4.5	5.2

* TBTGS data on fresh samples taken the day before that shown. This is to avoid confusion in data input to computer.

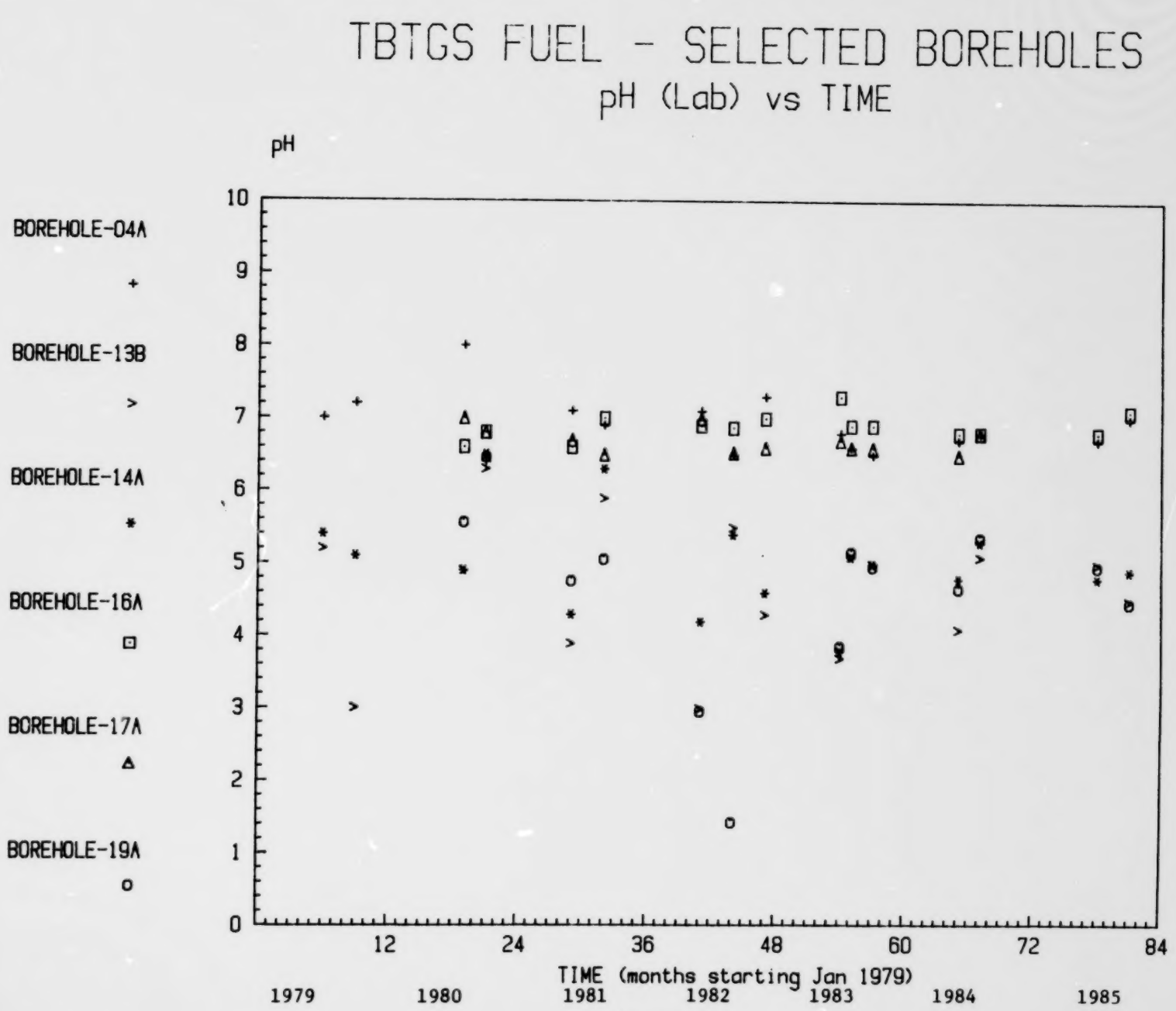
TBTGS FUEL - SELECTED BOREHOLES
pH (Lab) vs TIME
pH
BOREHOLE-04A
BOREHOLE-13B
BOREHOLE-14A
BOREHOLE-16A
BOREHOLE-17A
BOREHOLE-19A
0
1
2
3
4
5
6
7
8
9
10
12
24
36
48
60
72
84
TIME (months starting Jan 1979)
1979
1980
1981
1982
1983
1984
1985

FIGURE 3

(b) Alkalinity and Acidity

Summaries of the 1985 alkalinity and acidity levels in the groundwaters from the fuel storage areas are shown in Tables V and VI. Figures 4 and 5 show summaries of alkalinity and acidity levels in waters from six selected piezometers from 1979 through 1985. Data for piezometer 17A is not available for 1985.

From the alkalinity and acidity values determined at Research and shown in Table V and VI it is evident that some waters from piezometer nests 9, 12, 13, 14, 18 and 19 are very acidic and have no or low total alkalinities. The acidic waters from these locations are all on the east and south sides of the bituminous coal pile. Waters from the remaining piezometer nests had higher and variable alkalinity levels.

Plots of alkalinity and acidity (to pH 8.3) levels, Figures 4 and 5, of groundwaters from six selected piezometers, show that the 1985 levels are essentially unchanged from the 1984 levels.

As was the case with the data acquired during the previous studies, the 1985 data also show that waters of high acidities and low pH values are present in wells around the bituminous coal pile and waters of high alkalinities, and high pH levels are present in wells around the lignite coal pile. These findings are consistent with the fact that normal bituminous coal drainage is acidic and the hypothesis/7/ that lignite coal leachate is neutral or alkaline.

(c) Conductivity

A summary of the 1985 conductivity levels is given in Table VII. Figure 6 shows a summary of conductivity levels in waters from six selected piezometers from 1979 through 1985. Data for piezometer 17A is not available for 1985.

Groundwaters of low conductivities (<100 mS/m), indicating low ionic content of the waters, were present in some piezometers in nests 1,3,4,7,8,9, and 11. Piezometers 1A and 1B are located well inland and west of the lignite pile and their waters probably represent natural waters. Piezometer nests 7, 8 and 9, on the east side of the collecting lagoon have variable quality waters, some of low conductivities and some of high conductivities. Proximity of the collecting lagoon and drainage ditches are probably responsible for this condition.

TABLE V

FUEL STORAGE AREA GROUNDWATER QUALITY
TBTGS - 1985

TEST: ALK HCO_3 mg/L $CaCO_3$

Location	Sampling Date 850625	850626*	850911	950912*
01A	350	430	340	400
01B	190	360	260	360
03A	510	660	500	640
03B	440	720	430	760
04A	500	670	500	740
04B	530	880	480	910
04C	430	670	460	680
05A	270	780	270	350
05B	340	420	340	420
05C	970	1200	910	1200
06A	370	390	210	470
06B	570	610	400	730
06C	640	870	600	860
07A	350	360	350	330
07B	340	370	350	380
07C	170	220	140	190
08A	430	460	430	490
08B	130	150	89	120
08C	92	130	150	190
09A	330	370	320	370
09B	16	150	<5	160
09C	31	100	42	70
11A	280	360	270	300
11B	150	260	150	230
12A	52	170	21	160
12B	15	140	<5	160
12C	26	110	25	--
13A	<5	--	<5	--
13B	<5	140	<5	140
13C	<5	210	<5	240
14A	<5	170	6	130
14B	10	110	<5	100
14C	44	160	18	130
15A	770	900	790	1000
15B	850	880	870	1000
16A	680	880	590	890
16B	610	780	520	700
18A	12	200	44	230
18B	18	100	<5	150
19A	<5	130	<5	130
19B	11	60	<5	50

* TBTGS data on fresh samples taken the day before that shown. This is to avoid confusion in data input to computer.

TBTGS FUEL - SELECTED BOREHOLES

HCO3 ALKALINTY (Lab) vs TIME

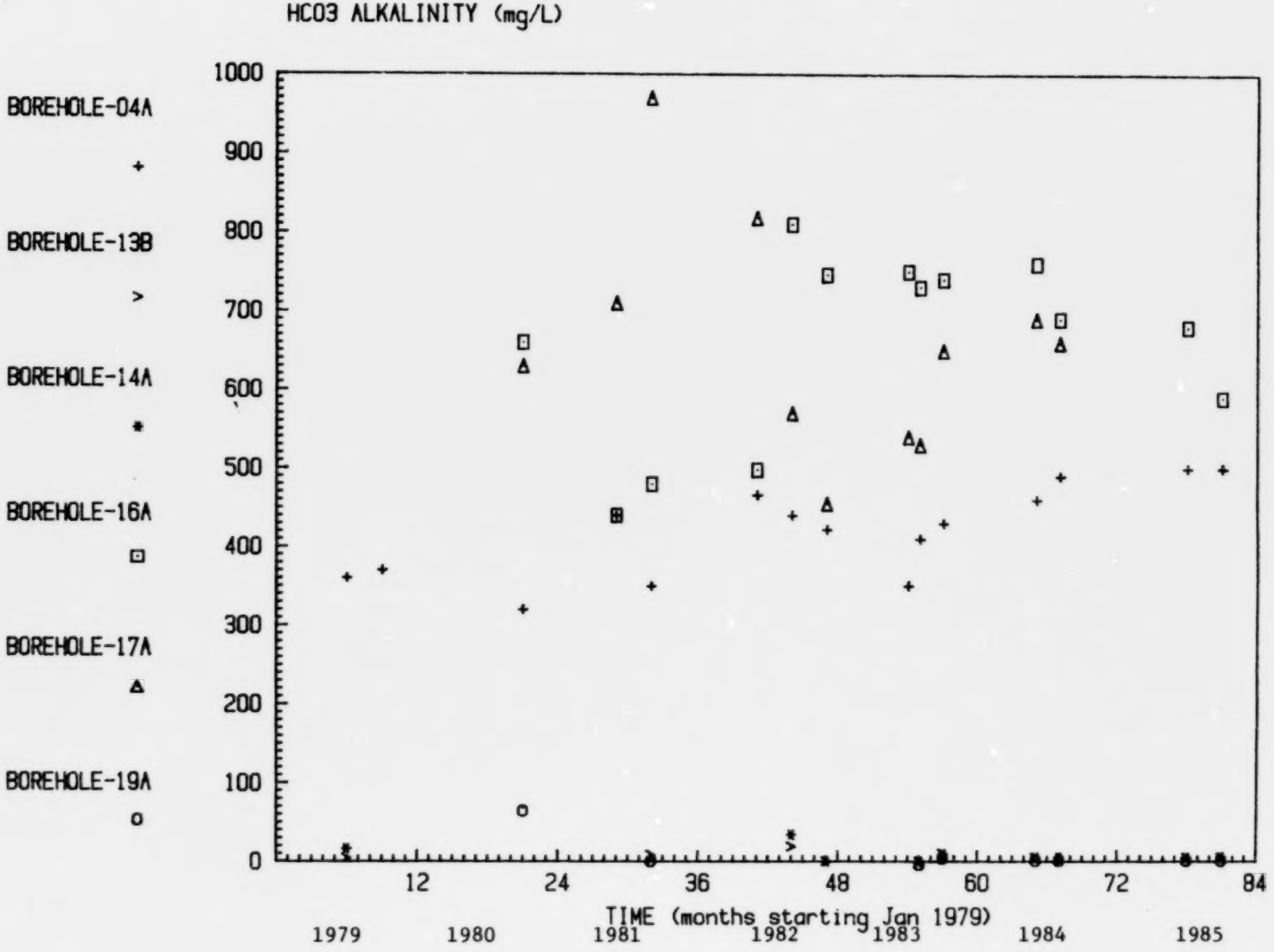

FIGURE 4

TABLE VI

FUEL STORAGE AREA GROUNDWATER QUALITY
TBTGS - 1985

TEST: ACID 8.3 mg/L $CaCO_3$

LOCATION	Sampling Date 850625	850911
01A	--	--
01B	--	--
03A	--	--
03B	--	--
04A	--	--
04B	--	--
04C	--	--
05A	--	--
05B	--	--
05C	--	--
06A	--	--
06B	--	--
06C	--	--
07A	--	--
07B	--	--
07C	--	--
08A	--	--
08B	--	--
08C	--	--
09A	--	--
09B	210	250
09C	--	--
11A	--	--
11B	--	--
12A	--	96
12B	310	360
12C	29	26
13A	630	840
13B	1300	1400
13C	1300	1100
14A	1000	1200
14B	380	390
14C	--	120
15A	--	--
15B	--	--
16A	--	--
16B	--	--
18A	1100	920
18B	350	450
19A	940	950
19B	430	410

TBTGS FUEL - SELECTED BOREHOLES

ACIDITY 8.3 vs TIME

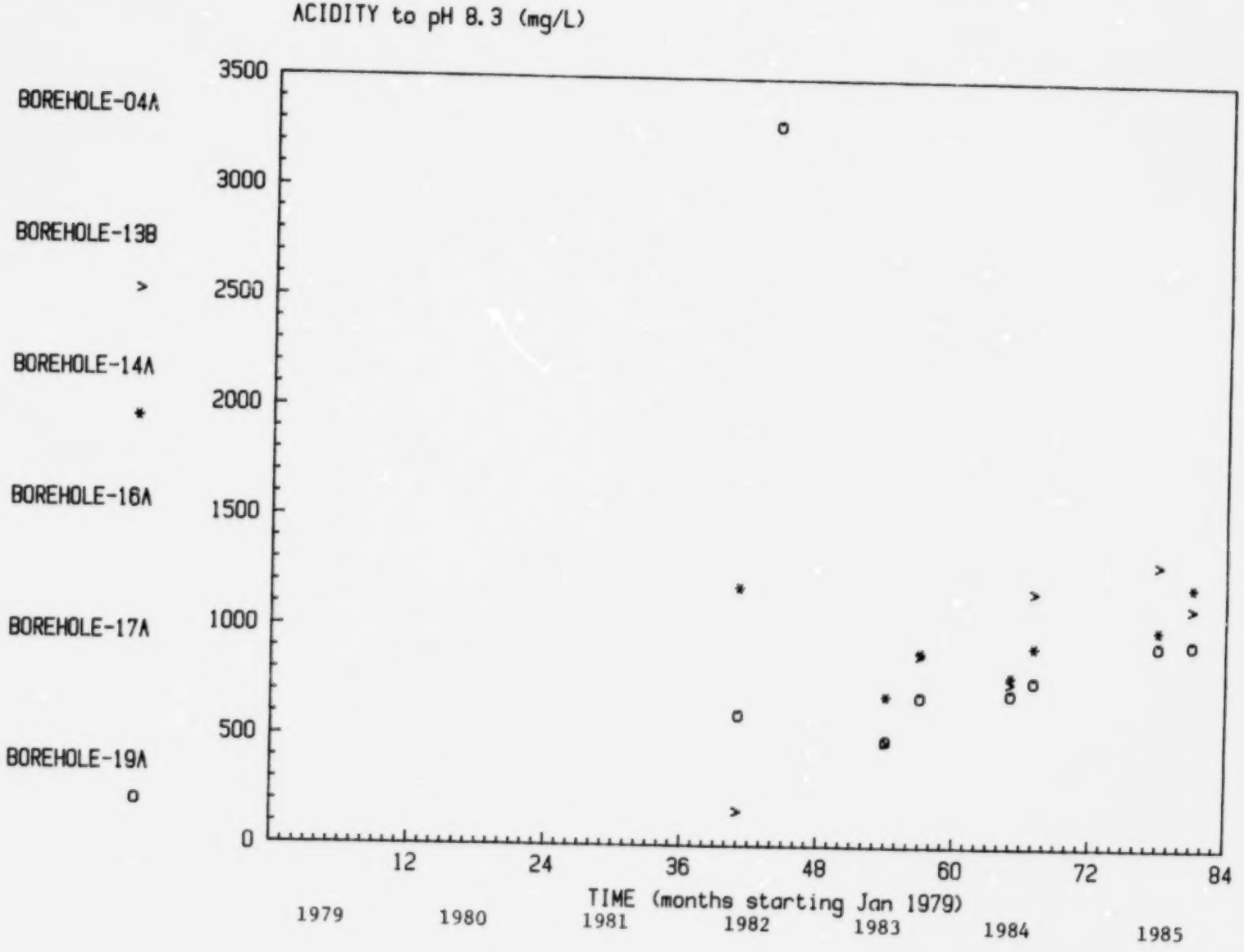

FIGURE 5

TABLE VII
FUEL STORAGE AREA GROUNDWATER QUALITY
TBTGS - 1985

TEST: COND mS/m

	Sampling Date			
LOCATION	850625	850626*	850911	850912*
01A	95	98	98	100
01B	58	73	63	78
03A	100	130	99	120
03B	82	100	81	100
04A	87	120	98	130
04B	240	240	200	280
04C	330	380	310	380
05A	310	330	310	360
05B	200	220	200	230
05C	200	240	180	230
06A	140	150	100	160
06B	190	220	170	240
06C	170	220	220	270
07A	320	360	330	380
07B	85	140	82	88
07C	34	42	29	42
08A	140	140	140	150
08B	34	30	21	22
08C	92	95	58	62
09A	220	250	210	250
09B	210	230	220	280
09C	140	140	52	59
11A	62	73	61	650
11B	39	55	38	510
12A	190	230	190	230
12B	220	240	240	300
12C	230	250	180	--
13A	310	380	360	440
13B	460	690	410	540
13C	490	690	470	560
14A	470	620	490	640
14B	320	400	340	440
14C	220	250	250	300
15A	150	190	150	180
15B	150	170	150	150
16A	170	210	140	180
16B	120	130	100	120
18A	440	680	400	520
18B	260	300	290	280
19A	440	670	440	560
19B	320	370	340	420

* TBTGS data on fresh samples taken the day before that shown. This is to avoid confusion in data input to computer.

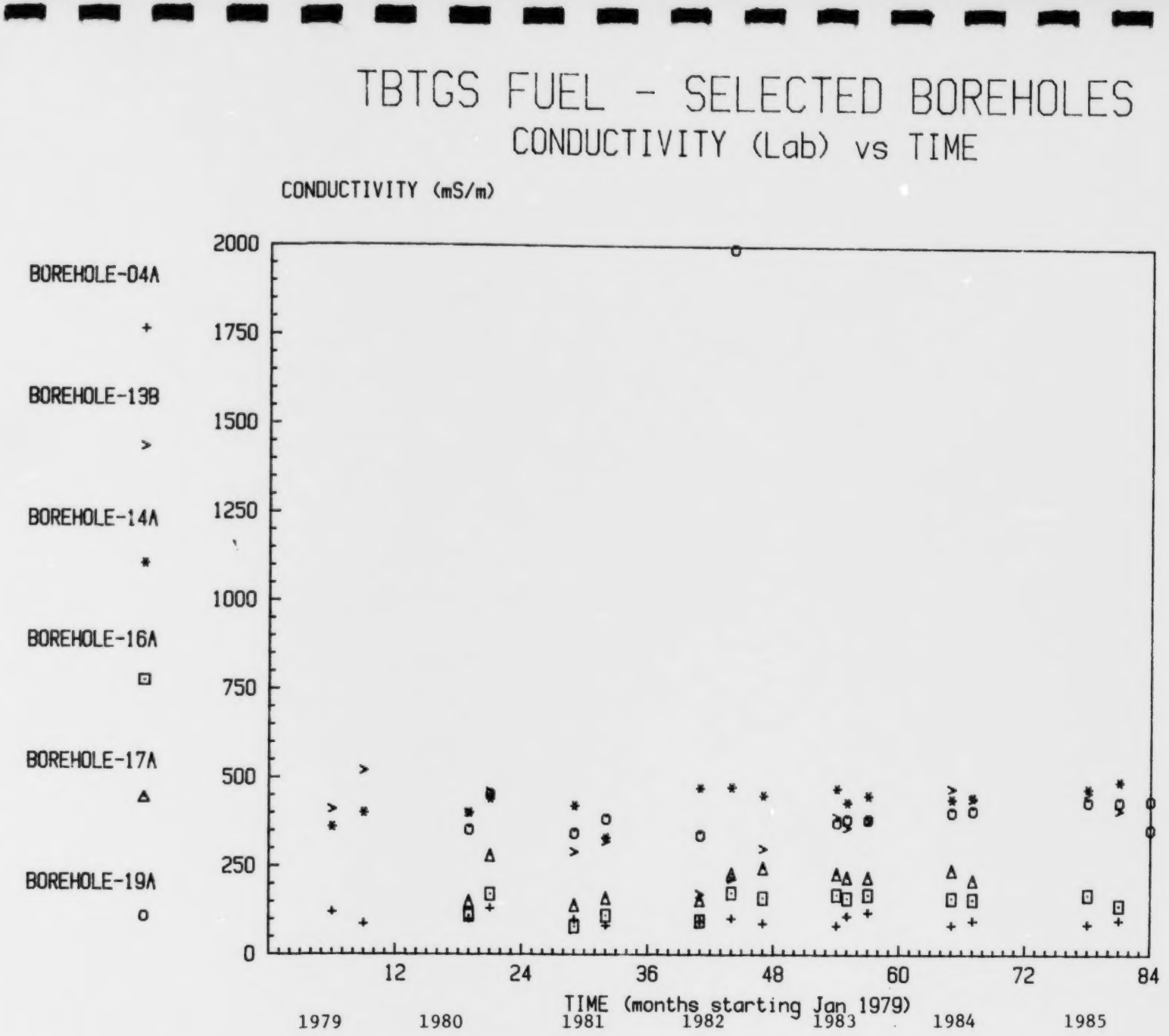
TBTGS FUEL - SELECTED BOREHOLES
CONDUCTIVITY (Lab) vs TIME
CONDUCTIVITY (mS/m)
2000
1750
1500
1250
1000
750
500
250
0
BOREHOLE-04A
+
BOREHOLE-13B
>
BOREHOLE-14A
*
BOREHOLE-16A
⊡
BOREHOLE-17A
Δ
BOREHOLE-19A
o
12
24
36
48
60
72
84
TIME (months starting Jan 1979)
1979
1980
1981
1982
1983
1984
1985

FIGURE 6

Waters from the remaining piezometers have higher and varying conductivities, the highest (>300 mS/m) of which are waters from piezometers 4C, 5A, 7A, 13ABC, 14ABC, 18AB and 19AB. With the exception of piezometers 4C, 5A and 7A, located around the lignite pile, the rest are located on the east and south sides of the bituminous coal pile and are the same piezometers that had waters of low pH and high acidity. The reason for high conductivity waters in piezometers 4C, 5A and 7A is not known but could possibly have been caused by contamination with high conductivity water flowing along the drainage ditch.

Figure 6 shows that from 1979 through 1985 conductivity levels of the groundwaters remained at about constant levels except for piezometer 19A (and 19B) in 1982 when the conductivity was very high for the August sample. The 1985 conductivity values of waters from piezometers 19A and 19B are high but not as extreme as in 1982. The unusually high conductivity levels for the September samples from piezometer 11A and 11B close to the maintenance building, are suspected to be erroneous measurements.

(d) Iron

The iron concentrations obtained in 1985 are summarized in Table VIII. Figure 7 summarizes the Fe levels in waters from six selected piezometers from 1979 through 1985. Data for piezometer 17A is not available for 1985.

Low iron concentrations (<10 mg/L) were found, on at least one occasion during the year, in groundwaters from piezometers 1A, 5A, 5B, 6A, 6B, 7ABC and 8ABC, 12C and 18A. Piezometer 1A is located inland and the rest east of the lignite coal pile and close to the shore where leachate contamination would be minimal.

High iron levels (>200 mg/L were found in piezometers 04B, 12B, 13A, 13B, 13C, 14A, 14B, 18A, 18B, 19A and 19B, most associated with waters having low pH, high conductivities and high SO_4 concentrations. All of these piezometers except 4B are located around the southeast corner of the bituminous coal pile where coal pile leachate is expected. The high iron level in piezometer 04B is unexplainable.

Figure 7 shows that as in previous years iron concentrations in the groundwaters in the fuel storage areas varied widely.

TABLE VIII

FUEL STORAGE AREA GROUNDWATER QUALITY
TBTGS - 1985

TEST: Fe mg/L

LOCATION	Sampling Date 850625	850911
01A	5.2	1.2
01B	55	54
03A	72	99
03B	130	130
04A	90	110
04B	330	320
04C	91	63
05A	0.06	3.2
05B	16	10
05C	100	11
06A	0.07	1.7
06B	31	0.02
06C	95	100
07A	3.6	2.2
07B	6.9	13
07C	2.9	3
08A	2.1	--
08B	3.0	0.42
08C	0.48	0.06
09A	27	3.2
09B	160	170
09C	56	2.4
11A	38	370
11B	69	21
12A	120	77
12B	200	250
12C	4.2	6.4
13A	300	470
13B	940	890
13C	1000	1000
14A	830	870
14B	250	290
14C	71	86
15A	54	130
15B	74	44
16A	83	120
16B	80	92
18A	830	0.08
18B	240	190
19A	660	670
19B	270	240

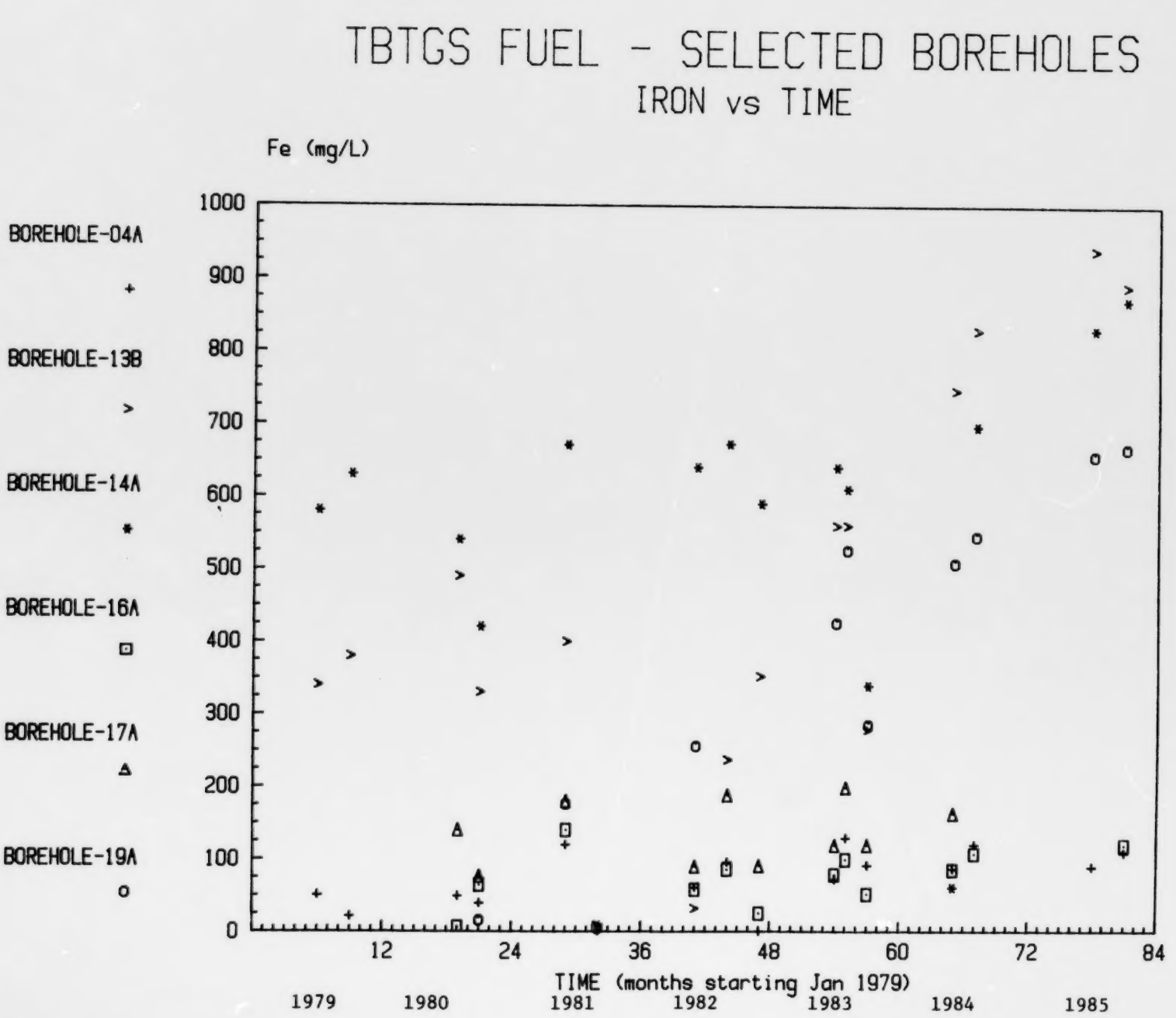
TBTGS FUEL - SELECTED BOREHOLES
IRON vs TIME
Fe (mg/L)
BOREHOLE-04A
BOREHOLE-13B
BOREHOLE-14A
BOREHOLE-16A
BOREHOLE-17A
BOREHOLE-19A
1000
900
800
700
600
500
400
300
200
100
0
12
24
36
48
60
72
84
TIME (months starting Jan 1979)
1979
1980
1981
1982
1983
1984
1985

FIGURE 7

(e) Sulphate

A summary of the 1985 sulphate concentrations in the groundwaters examined is shown in Table IX. Figure 8 shows a summary of SO_4 levels in waters from six selected piezometers from 1979 through 1985. Data for piezometer 17A is not available for 1985.

Low sulphate levels (<200 mg/L) were present in water from piezometer nests surrounding the lignite pile and from piezometers 11A and 11B (by the maintenance building). The 1985 SO_4 levels in piezometer 16B, inside the ditch, were somewhat lower (2.8 and 17 mg/L) than they were in 1984 (150 and 25 mg/L). However it is observed that sulphate levels in waters from piezometer nest 15 and 16 seem to fluctuate from year to year.

High sulphate levels (>300 mg/L) were present in piezometers around the bituminous coal pile and in piezometer 04B, 04C, 06C, 08C, 09A and 09B. High SO_4 levels are expected around the bituminous coal pile but not in piezometer nests 4 and 6 north and east of the lignite pile. This suggests possible change in lignite leachate characteristics or more likely of possible contamination of the waters in these locations by SO_4 rich aqueous wastes.

(f) Boron

A summary of the 1985 boron concentrations in the groundwaters examined is shown in Table X. Boron levels exceeding 1 mg/L were found in waters from piezometer nests 9, 12, 13, 14, 18 and 19, all east and south of the bituminous coal pile. These concentrations are not excessive and are essentially similar to those observed in previous years.

(g) Piper Plots

As was the case with the previous years' data, the 1985 analytic data on groundwater quality in the fuel storage areas show the presence of three distinct water types, as illustrated in typical Piper plots shown in Figures 9 and 10.

As before two of the groups are quite distinct and the third can be labelled as 'transitional'. One group of points, towards the apex of the diamond shaped area, represents waters from the acidic piezometers 09B, 09C, 12A, 12B, 12C, 13A, 13B, 13C, 14A, 14B, 14C, 18A, 18B, 19A and 19B, all located in the immediate vicinity of the biuminous coal pile. These waters contain little or no alkalinity but have high sulphate values.

TABLE IX

FUEL STORAGE AREA GROUNDWATER QUALITY
TBTGS - 1985

TEST: SO_4 mg/L

LOCATION	Sampling Date 850625	850911
01A	9.7	53
01B	58	33
03A	0.8	7.5
03B	1.1	1.0
04A	13	38
04B	960	790
04C	1600	1500
05A	1.5	2.9
05B	5.5	<0.5
05C	50	85
06A	0.6	1.4
06B	<0.5	1.8
06C	330	630
07A	2.7	9.0
07B	1.4	<0.5
07C	1.3	3.1
08A	19	2.7
08B	10	4.1
08C	350	140
09A	510	550
09B	1200	1400
09C	770	200
11A	1.4	<0.5
11B	0.8	<0.5
12A	990	980
12B	1400	1700
12C	1500	1100
13A	2200	2800
13B	3500	3300
13C	3800	4100
14A	3500	4100
14B	2200	2300
14C	1300	1600
15A	8.8	5.4
15B	100	38
16A	4.1	0.8
16B	17	2.8
18A	3400	3300
18B	1800	2000
19A	3200	3600
19B	2100	2500

TBTGS FUEL - SELECTED BOREHOLES

SULPHATE vs TIME

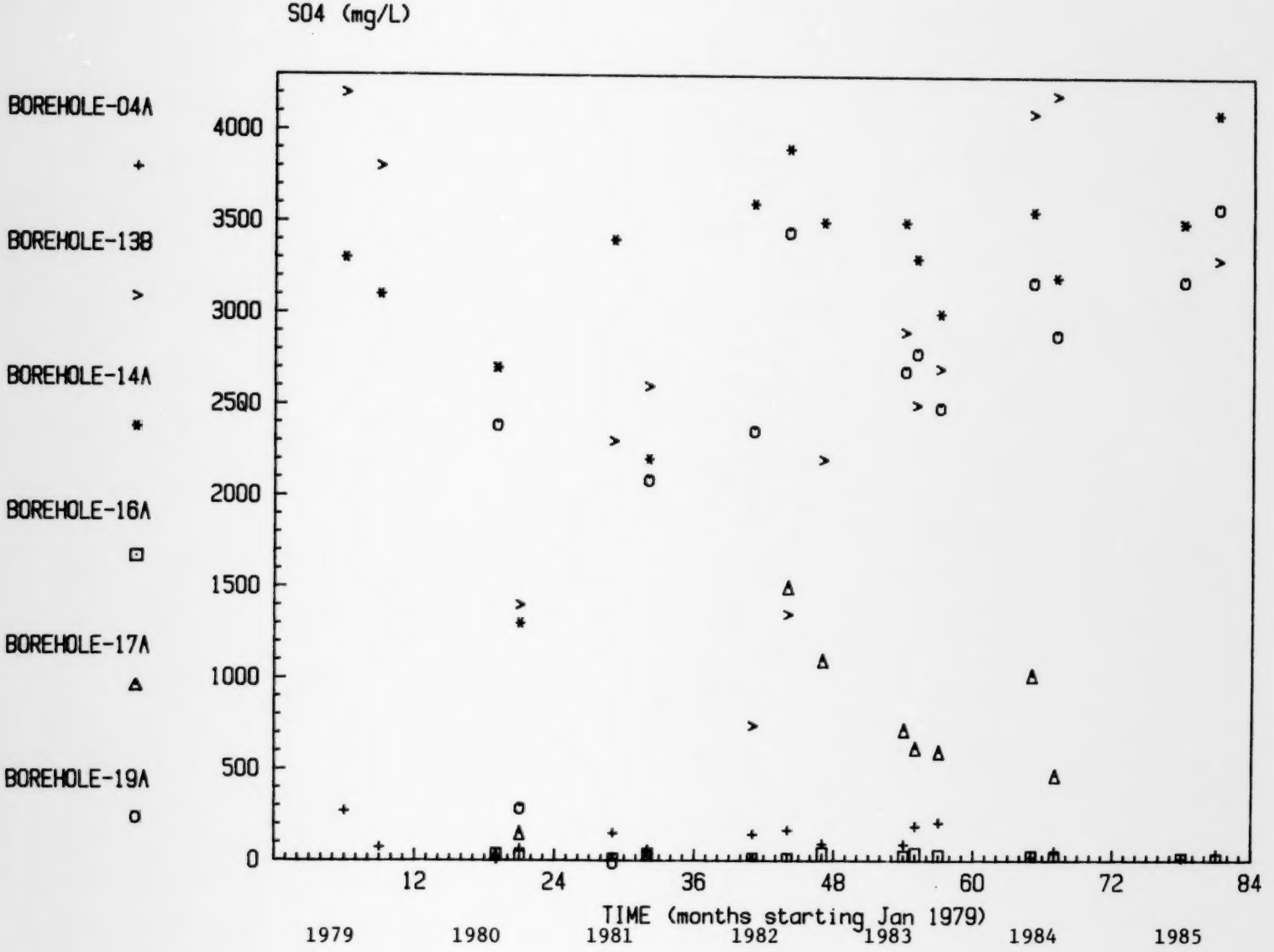

FIGURE 8

TABLE X

FUEL STORAGE AREA GROUNDWATER QUALITY
TBTGS - 1985

TEST: B mg/L

LOCATION	Sampling Date 850625	850911
01A	0.10	0.10
01B	0.46	0.48
03A	0.12	0.06
03B	0.13	0.08
04A	0.12	0.20
04B	0.56	0.06
04C	0.20	0.05
05A	<0.05	<0.05
05B	0.06	0.06
05C	0.18	0.16
06A	0.08	<0.05
06B	0.16	<0.05
06C	0.21	0.07
07A	0.15	0.05
07B	0.21	0.09
07C	0.80	0.70
08A	0.29	0.12
08B	0.46	0.42
08C	0.47	0.85
09A	0.47	0.35
09B	1.3	1.4
09C	1.5	0.75
11A	0.23	0.11
11B	0.28	0.34
12A	1.4	1.2
12B	1.4	1.4
12C	1.5	1.6
13A	2.2	2.7
13B	3.2	2.9
13C	3.2	3.3
14A	1.7	1.8
14B	1.5	1.4
14C	1.1	1.3
15A	0.24	0.21
15B	0.24	0.23
16A	0.31	0.14
16B	0.42	0.28
18A	2.8	2.6
18B	2.0	2.3
19A	1.7	1.7
19B	1.4	1.6

MAJOR ION CHEMISTRY
TBTGS FUEL
JUNE 25 1985
TYPE - WATER
FUEL STORAGE AREA GROUNDWATER QUALITY - 1985

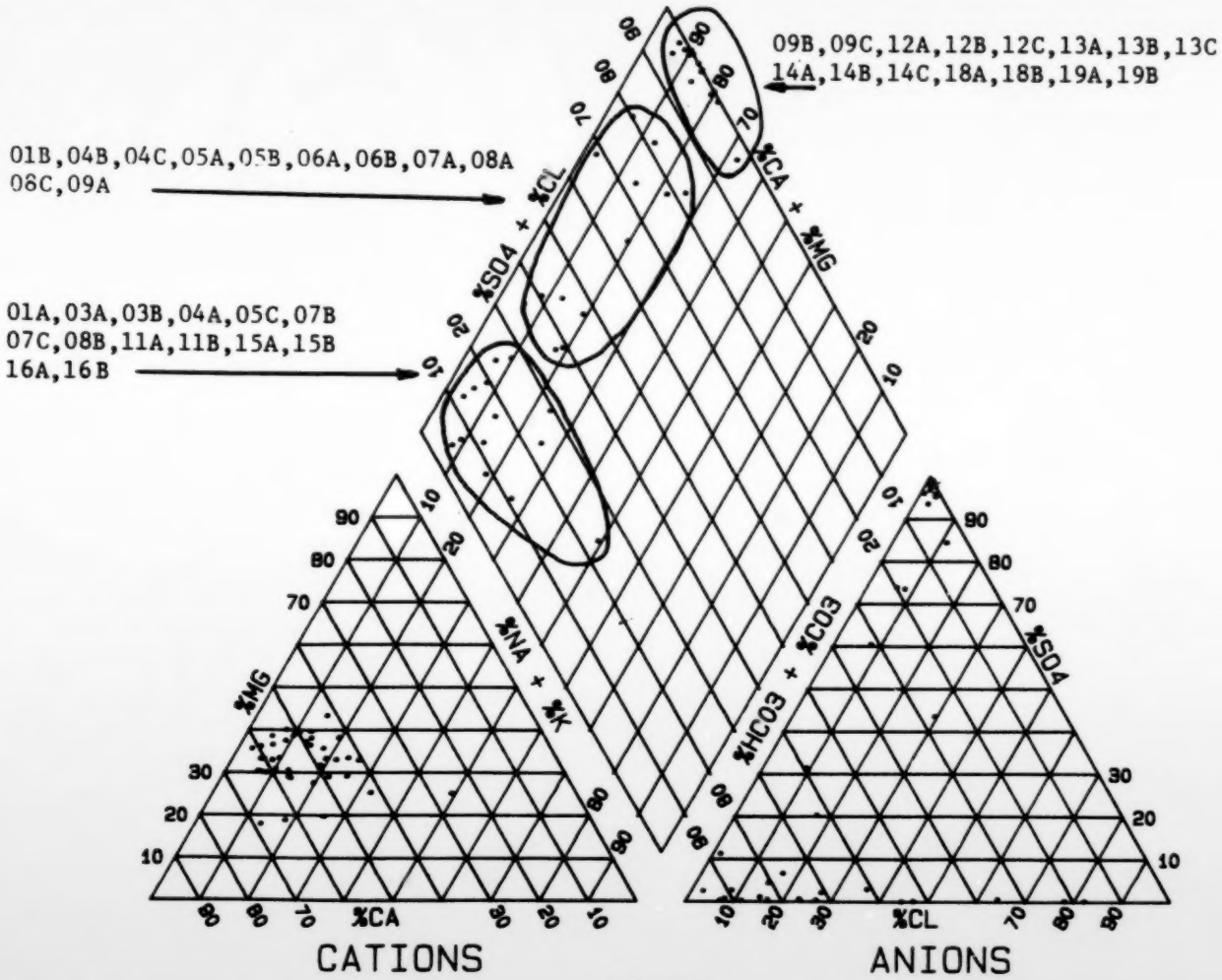

FIGURE 9

MAJOR ION CHEMISTRY
TBTGS FUEL
SEPT 11 1985
TYPE - WATER
FUEL STORAGE AREA GROUNDWATER QUALITY - 1985

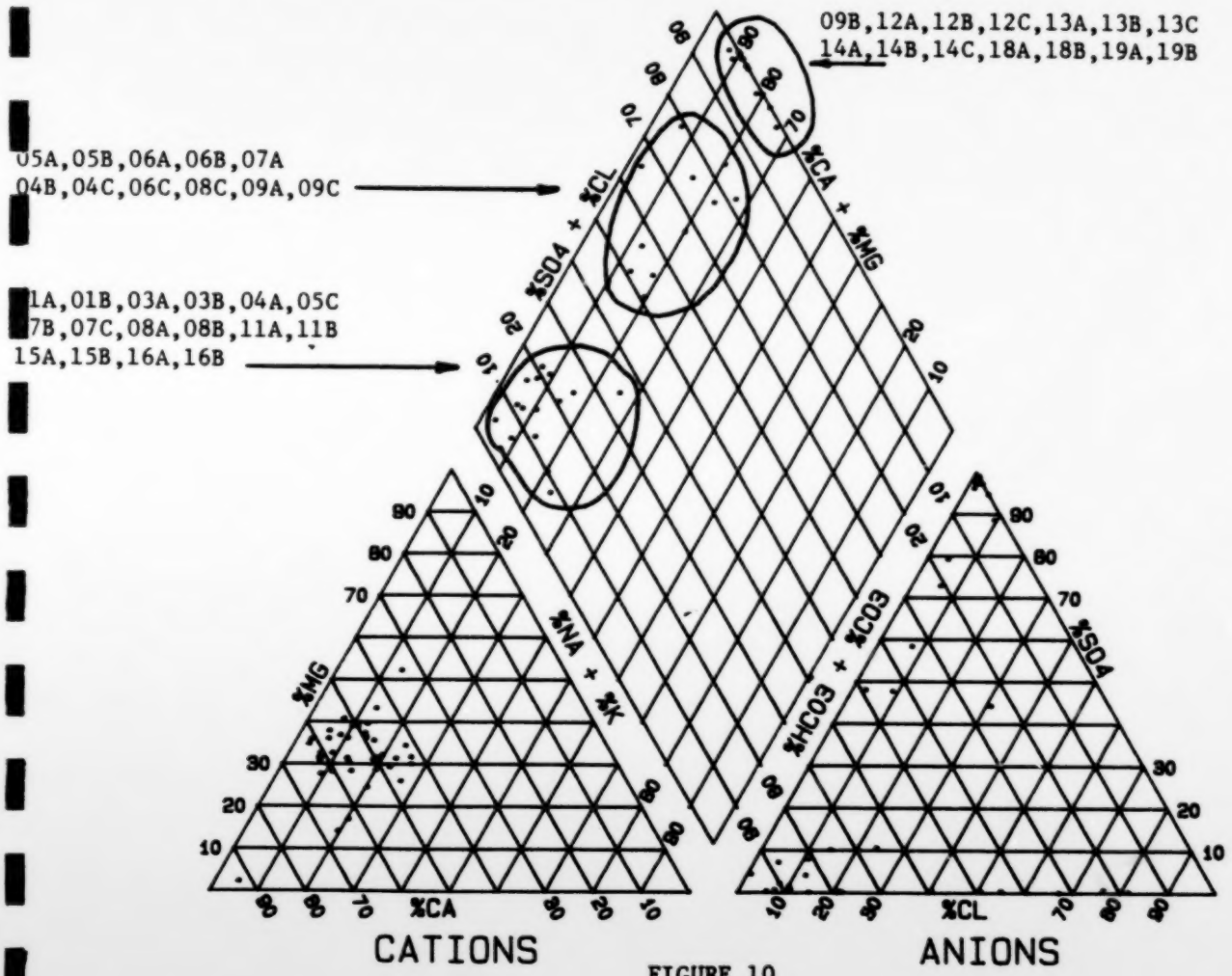

FIGURE 10

The second group of points, towards the middle left corner of the diamond shaped area represents natural or unaffected groundwaters at the site. Concentrations of SO_4 and Cl ions are generally below 40% of the anion total with alkalinity making up the difference. These waters were present at least once in piezometers 01A, 01B, 03A, 03B, 04A, 05C, 07B, 08A, 08B, 11A, 11B, 15A, 15B, 16A and 16B, all in the vicinity of the lignite pile.

The third group of points, midway between the two groups already discussed, can be referred to as representing transitional quality waters. These waters were present, on at least one occasion, in piezometers 01B, 04B, 04C, 05A, 05B, 06A, 06B, 06C, 07A, 08A, 08C, 09A and 09C. These piezometers are also located mainly around the lignite pile and close to the collecting lagoon. The somewhat different characteristics of these waters could be due to some influence from the coal pile drainage flowing along the draining ditches to the collecting lagoon.

(h) Drainage Ditches

In assessing the effect of the drainage ditches on the quality of the groundwater, pH, acidity, SO_4 and Fe concentrations in waters taken from piezometer nests 15 and 16, around the lignite coal pile, and from piezometers 14 and 19, at the south side of the bituminous coal pile, will be discussed.

The data show that there is no major difference in pH levels in waters from piezometers 15A and 15B, both outside the drainage ditch, and piezometers 16A and 16B on the lignite pile side of the ditch. Sulphate concentrations are low (<10 mg/L) in piezometer 15A (shallower) but are somewhat higher (>100 and 38 mg/L) in piezometer 15B (deeper) than in 16A or 16B, (a high of 17). Iron concentrations in piezometer nest 15 were a little lower (average of 76) than in piezometer nest 16 (average of 94).It appears therefore that for this location the drainage ditch had no clear effect on groundwater quality.

Differences in pH levels in waters from piezometer nest 14 (inside the ditch) and piezometer nest 19 (outside the ditch) on the southeast corner of the bituminous coal pile, are too small for any conclusions to be made on the effect of the ditch. However, there is evidence of a slight reduction in the SO_4 and Fe concentrations in the waters from piezometer nest 19 as compared to the concentrations in waters from piezometer nest 14. It is perhaps too soon for the ditches to have a definite effect on groundwater quality. On the other hand any positive but small effects of the ditches might be masked by natural variations in the groundwaters.

CONCLUSIONS

The 1985 data on the groundwater characteristics are similar to those acquired during the past years. The pattern of low pH levels and high sulphate and iron concentrations around the bituminous coal pile observed in the past are also evident in the 1985 data. Because pH, acidity and sulphate levels in waters on both sides of the drainage ditches are still inconsistent, no conclusion can be reached on the effect of the drainage ditches on groundwater quality.

Approved by:

for O.A. Kupcis
Manager
Chemical Research Dept

Prepared by:

J. Complak
Chemist
Environmental and
Inorganic Research Section

Reviewed by:

D. Dodd
Section Head
Environmental and
Inorganic Research Section

JC/DRC:lg:em

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APPENDIX A

FUEL STORAGE AREA
GROUNDWATER CHEMICAL ANALYSIS - TBTGS - 1985

(All values are in mg/L except pH and conductivity

- pH in pH units
- conductivity in mS/m

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 01A

TEST	850625	850626 *	850911	850912 *
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	350.	430.	340.	400.
ALKOH	<5.0	--	<5.0	--
B	.10	--	.10	--
CA	83.	--	85.	--
CL	96.	--	89.	--
COND	95.	98.	98.	100.
FE	5.2	--	1.2	--
K	2.4	--	2.2	--
MG	40.	--	38.	--
MN	8.6	--	8.2	--
NA	53.	--	59.	--
PH	7.2	6.6	7.4	6.7
SO4	9.7	--	53.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 01B

TEST	850625	850626*	850911	850912 *
			SAMPLING DATE	
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	190.	360.	260.	360.
ALKOH	<5.0	--	<5.0	--
B	.46	--	.48	--
CA	53.	--	66.	--
CL	36.	--	35.	--
COND	58.	73.	63.	78.
FE	55.	--	54.	--
K	3.5	--	3.8	--
MG	25.	--	29.	--
MN	5.0	--	6.1	--
NA	21.	--	23.	--
PH	6.6	6.5	7.0	6.4
SO4	58.	--	33.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 03A

TEST	850625	850626 *	850911	850912 *
			SAMPLING DATE	
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	510.	660.	500.	640.
ALKOH	<5.0	--	<5.0	--
B	.12	--	.060	--
CA	110.	--	120.	--
CL	47.	--	41.	--
COND	100.	130.	99.	120.
FE	72.	--	99.	--
K	2.2	--	2.1	--
MG	55.	--	53.	--
MN	1.2	--	1.4	--
NA	38.	--	36.	--
PH	6.7	6.5	6.9	6.4
SO4	.84	--	7.5	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 03B

TEST	850625	850626 *	850911	850912 *
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	440.	720.	430.	760.
ALKOH	<5.0	--	<5.0	--
B	.13	--	.080	--
CA	100.	--	110.	--
CL	24.	--	20.	--
COND	82.	100.	81.	100.
FE	130.	--	130.	--
K	3.3	--	3.4	--
MG	44.	--	44.	--
MN	1.8	--	1.8	--
NA	18.	--	18.	--
PH	6.6	6.6	6.8	6.3
SO4	1.1	--	1.0	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 04A

TEST	850625	850626*	850911	850912*
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	500.	670.	500.	740.
ALKOH	<5.0	--	<5.0	--
B	.12	--	.20	--
CA	110.	--	120.	--
CL	9.3	--	21.	--
COND	87.	120.	98.	130.
FE	90.	--	110.	--
K	6.2	--	7.4	--
MG	51.	--	57.	--
MN	1.1	--	1.5	--
NA	16.	--	16.	--
PH	6.7	6.4	7.0	6.4
SO4	13.	--	38.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 04B

TEST	850625	850626 *	850911	850912 *
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	530.	880.	480.	910.
ALKOH	<5.0	--	<5.0	--
B	.56	--	.060	--
CA	370.	--	320.	--
CL	93.	--	76.	--
COND	240.	240.	200.	280.
FE	330.	--	320.	--
K	2.7	--	2.1	--
MG	130.	--	110.	--
MN	47.	--	4.1	--
NA	19.	--	18.	--
PH	6.5	6.3	7.0	6.4
SO4	960.	--	790.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 04C

TEST	850625	850626 *	850911	850912 *
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	430.	670.	460.	680.
ALKOH	<5.0	--	<5.0	--
B	.20	--	.050	--
CA	540.	--	520.	--
CL	100.	--	97.	--
COND	330.	380.	310.	380.
FE	91.	--	63.	--
K	2.8	--	3.3	--
MG	180.	--	170.	--
MN	4.4	--	4.1	--
NA	60.	--	65.	--
PH	6.6	6.5	7.2	6.7
SO4	1600.	--	1500.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 05A

TEST	850625	850626 *	850911	850912 *
			SAMPLING DATE	
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	270.	780.	270.	350.
ALKOH	<5.0	--	<5.0	--
B	<.050	--	<.050	--
CA	270.	--	250.	--
CL	880.	--	860.	--
COND	310.	330.	310.	360.
FE	.060	--	3.2	--
K	4.1	--	3.7	--
MG	110.	--	110.	--
MN	3.2	--	3.2	--
NA	180.	--	180.	--
PH	7.7	7.0	7.6	6.9
SO4	1.5	--	2.9	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 05B

TEST	850625	850626*	850911	850912*
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	340.	420.	340.	420.
ALKOH	<5.0	--	<5.0	--
B	.060	--	.060	--
CA	200.	--	190.	--
CL	440.	--	500.	--
COND	200.	220.	200.	230.
FE	16.	--	10.	--
K	3.5	--	3.2	--
MG	64.	--	66.	--
MN	2.6	--	2.6	--
NA	86.	--	86.	--
PH	7.0	6.7	7.6	6.6
SO4	5.5	--	<.050	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 05C

TEST	850625	850626*	850911	850912*
			SAMPLING DATE	
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	970.	1200.	910.	1200.
ALKOH	<5.0	--	<5.0	--
B	.18	--	.16	--
CA	320.	--	300.	--
CL	130.	--	88.	--
COND	200.	240.	180.	230.
FE	100.	--	11.	--
K	4.0	--	3.9	--
MG	93.	--	94.	--
MN	3.4	--	3.6	--
NA	43.	--	38.	--
PH	6.9	6.6	7.3	6.6
SO4	50.	--	85.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 06A

TEST	850625	850626*	850911	850912*
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	370.	390.	210.	470.
ALKOH	<5.0	--	<5.0	--
B	.080	--	<.050	--
CA	130.	--	140.	--
CL	230.	--	180.	--
COND	140.	150.	100.	160.
FE	.070	--	1.7	--
K	2.8	--	2.7	--
MG	52.	--	53.	--
MN	2.1	--	2.1	--
NA	58.	--	59.	--
PH	7.7	6.9	7.5	6.9
SO4	.64	--	1.4	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 06B

TEST	850625	850626 *	850911	850912 *
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	570.	610.	400.	730.
ALKOH	<5.0	--	<5.0	--
B	.16	--	<.050	--
CA	220.	--	230.	--
CL	320.	--	300.	--
COND	190.	220.	170.	240.
FE	31.	--	.023	--
K	3.5	--	3.3	--
MG	73.	--	77.	--
MN	2.4	--	2.4	--
NA	57.	--	63.	--
PH	6.9	6.6	7.4	6.8
SO4	<.50	--	1.8	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 06C

TEST	SAMPLING DATE 850625	850626*	850911	850912*
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	640.	870.	600.	860.
ALKOH	<5.0	--	<5.0	--
B	.21	--	.070	--
CA	260.	--	320.	--
CL	71.	--	86.	--
COND	170.	220.	220.	270.
FE	95.	--	100.	--
K	4.1	--	4.3	--
MG	88.	--	110.	--
MN	2.1	--	2.5	--
NA	41.	--	83.	--
PH	6.7	6.4	7.0	6.4
SO4	330.	--	630.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 07A

TEST	850625	850626*	850911	850912*
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	350.	360.	350.	330.
ALKOH	<5.0	--	<5.0	--
B	.15	--	.050	--
CA	300.	--	310.	--
CL	890.	--	830.	--
COND	320.	360.	330.	380.
FE	3.6	--	2.2	--
K	4.4	--	3.8	--
MG	110.	--	110.	--
MN	2.8	--	2.7	--
NA	150.	--	170.	--
PH	7.7	6.8	7.6	6.7
SO4	2.7	--	9.0	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 07B

TEST	SAMPLING DATE 850625	850626 *	850911	850912 *
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	340.	370.	350.	380.
ALKOH	<5.0	--	<5.0	--
B	.21	--	.090	--
CA	100.	--	100.	--
CL	90.	--	70.	--
COND	85.	140.	82.	88.
FE	6.9	--	13.	--
K	1.6	--	1.7	--
MG	35.	--	35.	--
MN	1.5	--	1.4	--
NA	19.	--	18.	--
PH	7.2	6.8	7.4	6.8
SO4	1.4	--	<.50	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 07C

TEST	SAMPLING DATE 850625	850626*	850911	850912*
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	170.	220.	140.	190.
ALKOH	<5.0	--	<5.0	--
B	.80	--	.70	--
CA	43.	--	40.	--
CL	10.	--	9.0	--
COND	34.	42.	29.	42.
FE	2.9	--	3.0	--
K	2.2	--	2.5	--
MG	7.8	--	6.6	--
MN	.59	--	.47	--
NA	13.	--	14.	--
PH	7.4	6.8	7.5	6.8
SO4	1.3	--	3.1	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 08A

TEST	850625	850626 *	850911	850912 *
		SAMPLING DATE		
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	430.	460.	430.	490.
ALKOH	<5.0	--	<5.0	--
B	.29	--	.12	--
CA	140.	--	--	--
CL	180.	--	210.	--
COND	140.	140.	140.	150.
FE	2.1	--	--	--
K	2.7	--	--	--
MG	53.	--	--	--
MN	2.0	--	--	--
NA	59.	--	--	--
PH	7.5	7.0	7.7	7.0
SO4	19.	--	2.7	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 08B

TEST	850625	850626*	850911	850912*
			SAMPLING DATE	
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	130.	150.	89.	120.
ALKOH	<5.0	--	<5.0	--
B	.46	--	.42	--
CA	34.	--	250.	--
CL	20.	--	9.5	--
COND	34.	30.	21.	22.
FE	3.0	--	.42	--
K	2.0	--	2.1	--
MG	7.4	--	3.5	--
MN	.43	--	.23	--
NA	17.	--	15.	--
PH	7.5	6.9	7.6	6.9
SO4	10.	--	4.1	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 08C

TEST	850625	850626 *	850911	850912 *
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	92.	130.	150.	190.
ALKOH	<5.0	--	<5.0	--
B	.47	--	.85	--
CA	130.	--	80.	--
CL	29.	--	6.7	--
COND	92.	95.	58.	62.
FE	.48	--	.056	--
K	5.1	--	4.8	--
MG	21.	--	10.	--
MN	9.2	--	5.2	--
NA	27.	--	24.	--
PH	7.0	6.6	7.5	6.7
SO4	350.	--	140.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 09A

TEST	SAMPLING DATE 850625	850626*	850911	850912*
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	330.	370.	320.	370.
ALKOH	<5.0	--	<5.0	--
B	.47	--	.35	--
CA	300.	--	290.	--
CL	250.	--	290.	--
COND	220.	250.	210.	250.
FE	27.	--	3.2	--
K	2.8	--	2.8	--
MG	91.	--	88.	--
MN	2.6	--	2.5	--
NA	85.	--	88.	--
PH	6.9	6.7	7.4	7.1
SO4	510.	--	550.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 09B

TEST	850625	850626 *	850911	850912 *
			SAMPLING DATE	
ACID4.5	--	--	--	--
ACID8.3	210.	--	250.	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	16.	150.	<5.0	160.
ALKOH	<5.0	--	<5.0	--
B	1.3	--	1.4	--
CA	280.	--	300.	--
CL	35.	--	57.	--
COND	210.	230.	220.	280.
FE	160.	--	170.	--
K	3.6	--	4.7	--
MG	83.	--	85.	--
MN	29.	--	34.	--
NA	44.	--	64.	--
PH	5.6	6.1	4.8	6.1
SO4	1200.	--	1400.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 09C

TEST	850625	850626 *	850911	850912 *
			SAMPLING DATE	
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	31.	100.	42.	70.
ALKOH	<5.0	--	<5.0	--
B	1.5	--	.75	--
CA	170.	--	56.	--
CL	18.	--	8.6	--
COND	140.	140.	52.	59.
FE	56.	--	2.4	--
K	5.6	--	3.0	--
MG	52.	--	15.	--
MN	18.	--	4.2	--
NA	44.	--	22.	--
PH	6.0	5.9	6.5	6.0
SO4	770.	--	200.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 11A

TEST	850625	850626*	850911	850912*
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	280.	360.	270.	300.
ALKOH	<5.0	--	<5.0	--
B	.23	--	.11	--
CA	68.	--	72.	--
CL	40.	--	34.	--
COND	62.	73.	61.	650.
FE	38.	--	370.	--
K	14.	--	1.5	--
MG	31.	--	29.	--
MN	.87	--	.90	--
NA	13.	--	16.	--
PH	6.8	6.7	7.0	6.5
SO4	1.4	--	<.50	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 11B

TEST	850625	850626*	850911	850912*
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	150.	260.	150.	230.
ALKOH	<5.0	--	<5.0	--
B	.28	--	.34	--
CA	34.	--	40.	--
CL	34.	--	28.	--
COND	39.	55.	38.	510.
FE	69.	--	21.	--
K	1.2	--	1.9	--
MG	20.	--	18.	--
MN	1.3	--	2.0	--
NA	74.	--	12.	--
PH	6.4	6.5	6.9	6.4
SO4	.76	--	<.50	--

*TBTGS field data: Dated one day after actual sampling for conveninece of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 12A

TEST	850625	850626*	850911	850912*
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	--	--	96.	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	52.	170.	21.	160.
ALKOH	<5.0	--	<5.0	--
B	1.4	--	1.2	--
CA	250.	--	270.	--
CL	99.	--	79.	--
COND	190.	230.	190.	230.
FE	120.	--	77.	--
K	2.7	--	3.1	--
MG	85.	--	83.	--
MN	6.8	--	5.5	--
NA	31.	--	37.	--
PH	6.0	6.5	5.5	6.3
SO4	990.	--	980.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 12B

TEST	SAMPLING DATE 850625	850626 *	850911	850912 *
ACID4.5	--	--	15.	--
ACID8.3	310.	--	360.	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	15.	140.	<5.0	160.
ALKOH	<5.0	--	<5.0	--
B	1.4	--	1.4	--
CA	270.	--	310.	--
CL	35.	--	36.	--
COND	220.	240.	240.	300.
FE	200.	--	250.	--
K	3.9	--	4.2	--
MG	85.	--	93.	--
MN	47.	--	51.	--
NA	51.	--	55.	--
PH	5.7	6.1	4.0	6.1
SO4	1400.	--	1700.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 12C

TEST	850625	850626 *	850911	850912 *
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	29.	--	26.	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	26.	110.	25.	--
ALKOH	<5.0	--	<5.0	--
B	1.5	--	1.6	--
CA	380.	--	270.	--
CL	19.	--	14.	--
COND	230.	250.	180.	--
FE	4.2	--	6.4	--
K	6.9	--	6.6	--
MG	110.	--	73.	--
MN	57.	--	34.	--
NA	43.	--	43.	--
PH	5.8	5.3	5.7	--
SO4	1500.	--	1100.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 13A

TEST	850625	850626 *	850911	850912 *
	SAMPLING DATE			
ACID4.5	17.	--	26.	--
ACID8.3	630.	--	840.	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	<5.0	--	<5.0	--
ALKOH	<5.0	--	<5.0	--
B	2.2	--	2.7	--
CA	310.	--	360.	--
CL	19.	--	21.	--
COND	310.	380.	360.	440.
FE	300.	--	470.	--
K	16.	--	16.	--
MG	160.	--	180.	--
MN	57.	--	60.	--
NA	89.	--	100.	--
PH	4.0	3.7	3.8	3.6
SO4	2200.	--	2800.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 13B

TEST	850625	850626*	850911	850912 *
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	1300.	--	1100.	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	<5.0	140.	<5.0	140.
ALKOH	<5.0	--	<5.0	--
B	3.2	--	2.9	--
CA	450.	--	430.	--
CL	25.	--	23.	--
COND	460.	690.	410.	540.
FE	940.	--	890.	--
K	10.	--	11.	--
MG	210.	--	200.	--
MN	120.	--	95.	--
NA	110.	--	110.	--
PH	5.0	5.7	4.5	6.7
SO4	3500.	--	3300.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 13C

TEST	850625	850626 *	850911	850912 *
			SAMPLING DATE	
ACID4.5	--	--	<5.0	--
ACID8.3	1300.	--	1400.	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	<5.0	210.	<5.0	240.
ALKOH	<5.0	--	<5.0	--
B	3.2	--	3.3	--
CA	490.	--	480.	--
CL	25.	--	26.	--
COND	490.	690.	470.	560.
FE	1000.	--	1000.	--
K	8.8	--	9.1	--
MG	220.	--	220.	--
MN	130.	--	110.	--
NA	110.	--	110.	--
PH	5.1	5.9	4.0	6.0
SO4	3800.	--	4100.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 14A

TEST	850625	850626*	850911	850912*
			SAMPLING DATE	
ACID4.5	--	--	--	--
ACID8.3	1000.	--	1200.	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	<5.0	170.	6.0	130.
ALKOH	<5.0	--	<5.0	--
B	1.7	--	1.8	--
CA	430.	--	480.	--
CL	62.	--	61.	--
COND	470.	620.	490.	640.
FE	830.	--	870.	--
K	4.9	--	4.4	--
MG	270.	--	280.	--
MN	97.	--	94.	--
NA	170.	--	160.	--
PH	4.8	6.0	4.9	5.6
SO4	3500.	--	4100.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 14B

TEST	850625	850626*	850911	850912*
			SAMPLING DATE	
ACID4.5	--	--	19.	--
ACID8.3	380.	--	390.	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	10.	110.	<5.0	100.
ALKOH	<5.0	--	<5.0	--
B	1.5	--	1.4	--
CA	350.	--	390.	--
CL	17.	--	19.	--
COND	320.	400.	340.	440.
FE	250.	--	290.	--
K	6.4	--	7.3	--
MG	150.	--	160.	--
MN	60.	--	65.	--
NA	190.	--	220.	--
PH	5.6	5.9	4.2	5.7
SO4	2200.	--	2300.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 14C

TEST	850625	850626*	850911	850912*
			SAMPLING DATE	
ACID4.5	--	--	--	--
ACID8.3	--	--	120.	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	44.	160.	18.	130.
ALKOH	<5.0	--	<5.0	--
B	1.1	--	1.3	--
CA	220.	--	280.	--
CL	8.3	--	12.	--
COND	220.	250.	250.	300.
FE	71.	--	86.	--
K	3.7	--	4.1	--
MG	81.	--	94.	--
MN	34.	--	38.	--
NA	200.	--	180.	--
PH	6.2	6.0	5.3	6.0
SO4	1300.	--	1600.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 15A

TEST	850625	850626 *	850911	850912 *
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	770.	900.	790.	1000.
ALKOH	<5.0	--	<5.0	--
B	.24	--	.21	--
CA	200.	--	210.	--
CL	97.	--	69.	--
COND	150.	190.	150.	180.
FE	54.	--	130.	--
K	2.5	--	2.0	--
MG	83.	--	85.	--
MN	3.8	--	3.2	--
NA	22.	--	25.	--
PH	6.9	6.6	7.1	6.6
SO4	8.8	--	5.4	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 15B

TEST	850625	850626*	850911	850912*
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	850.	880.	870.	1000.
ALKOH	<5.0	--	<5.0	--
B	.24	--	.23	--
CA	220.	--	230.	--
CL	11.	--	6.1	--
COND	150.	170.	150.	150.
FE	74.	--	44.	--
K	7.1	--	7.0	--
MG	82.	--	79.	--
MN	8.8	--	9.1	--
NA	15.	--	11.	--
PH	7.1	6.4	7.3	6.6
SO4	100.	--	38.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 16A

TEST	850625	850626*	850911	850912*
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	680.	880.	590.	890.
ALKOH	<5.0	--	<5.0	--
B	.31	--	.14	--
CA	200.	--	210.	--
CL	150.	--	110.	--
COND	170.	210.	140.	180.
FE	83.	--	120.	--
K	2.6	--	2.7	--
MG	80.	--	80.	--
MN	2.5	--	2.4	--
NA	27.	--	27.	--
PH	6.8	6.5	7.1	6.6
SO4	4.1	--	.81	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 16B

TEST	850625	850626 *	850911	850912 *
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	--	--	--	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	610.	780.	520.	700.
ALKOH	<5.0	--	<5.0	--
B	.42	--	.28	--
CA	110.	--	100.	--
CL	41.	--	31.	--
COND	120.	130.	100.	120.
FE	80.	--	92.	--
K	11.	--	9.9	--
MG	52.	--	51.	--
MN	1.5	--	1.4	--
NA	74.	--	61.	--
PH	6.8	6.5	7.1	6.9
SO4	17.	--	2.8	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 18A

TEST	850625	850626 *	850911	850912 *
			SAMPLING DATE	
ACID4.5	--	--	--	--
ACID8.3	1100.	--	920.	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	12.	200.	44.	230.
ALKOH	<5.0	--	<5.0	--
B	2.8	--	2.6	--
CA	450.	--	140.	--
CL	25.	--	37.	--
COND	440.	680.	400.	520.
FE	830.	--	.077	--
K	8.9	--	2.4	--
MG	200.	--	54.	--
MN	110.	--	1.7	--
NA	150.	--	59.	--
PH	5.6	5.9	5.4	6.0
SO4	3400.	--	3300.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 18B

TEST	850625	850626*	850911	850912 *
			SAMPLING DATE	
ACID4.5	--	--	--	--
ACID8.3	350.	--	450.	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	18.	100.	<5.0	150.
ALKOH	<5.0	--	<5.0	--
B	2.0	--	2.3	--
CA	260.	--	260.	--
CL	16.	--	19.	--
COND	260.	300.	290.	280.
FE	240.	--	190.	--
K	7.9	--	7.9	--
MG	110.	--	100.	--
MN	71.	--	56.	--
NA	120.	--	120.	--
PH	5.8	5.9	4.8	6.0
SO4	1800.	--	2000.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 19A

TEST	850625	850626*	850911	850912*
	SAMPLING DATE			
ACID4.5	--	--	--	--
ACID8.3	940.	--	950.	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	<5.0	130.	<5.0	130.
ALKOH	<5.0	--	<5.0	--
B	1.7	--	1.7	--
CA	390.	--	430.	--
CL	43.	--	46.	--
COND	440.	670.	440.	560.
FE	660.	--	670.	--
K	5.3	--	5.3	--
MG	210.	--	400.	--
MN	84.	--	83.	--
NA	200.	--	200.	--
PH	5.0	5.9	4.5	5.6
SO4	3200.	--	3600.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.

FUEL STORAGE AREA GROUNDWATER QUALITY - TBTGS - 1985

LOCATION : 19B

TEST	850625	850626 *	850911	850912 *
			SAMPLING DATE	
ACID4.5	--	--	--	--
ACID8.3	430.	--	410.	--
ALKCO3	<5.0	--	<5.0	--
ALKHCO3	11.	60.	<5.0	50.
ALKOH	<5.0	--	<5.0	--
B	1.4	--	1.6	--
CA	300.	--	240.	--
CL	22.	--	21.	--
COND	320.	370.	340.	420.
FE	270.	--	240.	--
K	9.3	--	10.	--
MG	150.	--	180.	--
MN	71.	--	69.	--
NA	170.	--	180.	--
PH	5.5	5.3	4.5	5.2
SO4	2100.	--	2500.	--

*TBTGS field data: Dated one day after actual sampling for convenience of computer retrieval.